The Australian and New Zealand Journal of Surgery

APRIL, 1945.

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Royal College of Surgeons of England.

JACKSONIAN PRIZE.

THE Council of the Royal Australasian College of Surgeons has been advised by the Council of the Royal College of Surgeons of England that the subject chosen for the Jacksonian Prize for the year 1945 is as follows: "Bone Grafting in Surgery: Its Indications, Methods and Results." Full details governing the conditions of the prize may be obtained from the Secretary of the Royal Australasian College of Surgeons, Spring Street, Melbourne, C.1.

Editorial Notices.

ALL articles submitted for publication in this journal must be typewritten and double or treble spacing should be used. Each article should conclude with a brief summary and statement of conclusions. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

Authors are requested to submit two typescript copies of all articles.

References to articles and books should be carefully checked. In a reference the following information should be given without any abbreviation: initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given, with full date in each instance.

When illustrations are required, good photographic prints on glossy gaslight paper should be submitted. Line drawings, charts, graphs and so forth should be drawn on thick white paper in indian ink. Authors who are not accustomed to prepare drawings of this kind, are invited to seek the advice of the Editor if they are in any doubt as to the correct procedure. Skiagrams can be reproduced satisfactorily only if good prints or negatives are available.

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Corrigendum.

IN the issue of January, 1945, a transposition of blocks occurred in the article by J. B. G. Muir. The block marked Figure II should have been Figure XIII and *vice versa*. The legends remain as they were.

The announcements appearing in this journal contribute largely towards the maintenance of the high standard of the publication. It is, therefore, requested that, wherever possible, readers will support the business houses whose advertisements appear in the journal and that, when placing their orders, they will mention THE AUSTRALIAN AND NEW ZEALAND JOURNAL OF SURGERY.

THE AUSTRALIAN AND NEW ZEALAND JOURNAL OF SURGERY

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SUBTOTAL COLECTOMY.[1]

By SIR HUGH DEVINE,
Melbourne.

TOTAL COLECTOMY, the removal of the colon to the recto-sigmoid junction, is the only operation which holds out a reasonable prospect of surgical cure in the case of diseases such as ulcerative colitis, multiple polyposis, Hirschsprung's disease and megalocolon. That total colectomy as surgical treatment for these diseases is not based on sound premises can rightly be argued since in all of them the rectum is also more or less involved. Nevertheless this operation is of considerable practical value because it permits the removal of nearly all of the diseased area. And when this is removed, the disease of the rectum can be dealt with on other principles. In the case of ulcerative colitis, the great improvement in the patient's general health consequent on the removal of a large area of infective inflammatory tissue, enables him more or less to deal with the residual disease. In the case of a disease like multiple polyposis, there are now great possibilities with excision by local operation or sigmoidoscopic removal. Surgical treatment for this disease, based on ideal lines, would of course be removal of the whole diseased area—the colon and the rectum. But this involves the great misery of a permanent enterostomy—a great price for a patient to pay.

However, the practical value of total colectomy is rendered somewhat void by the fact that the mortality rate of the operation is unduly high, and, when used for a pathological condition such as ulcerative colitis, so high that the operation becomes unpractical.

Feeling that I wanted to utilize the good results of total colectomy as routine surgical treatment for colonic disease, without incurring its great operation dangers, I have contrived an operation of what amounts to an almost complete colectomy—a subtotal colectomy. I have described this operation in a paper in *Surgery, Gynecology and Obstetrics* under the heading of "A Method of Colectomy for Desperate Cases of Ulcerative Colitis".[1]

In this operation, the lower three or four inches of the sigmoid (enough to reach the pubis) are spared, left in continuity with the rectum and used as an isthmus to connect the ileum to the rectum by the spur-and-enterotome method. The point in leaving this segment is: Peritonitis is the cause of the high operation mortality rate after total colectomy. The peritonitis arises from the sutures of the ileo-rectal anastomosis. And when these sutures are made in infected tissues, as in the case of ulcerative colitis, every suture hole is an originating point of peritonitis. It is because no sutures are used in

[1] Accepted for publication on November 21, 1944.

the spur-and-enterotome method of anastomosis that peritonitis, even in infected tissues, rarely follows this method of anastomosis. Thus it is the spur-and-enterotome method that reduces the operation mortality rate to reasonable limits. And to have the benefit of this, retention of a small piece of diseased sigmoid takes little from the therapeutic value of the operation, since it is continuous with a more or less diseased rectum. It is the removal of most of the disease (in some cases of nearly three feet of diseased colonic tissue), for example in Case I, that restores health and confers on the body the power to deal with the remnant of the diseased tissue.

The theme of this paper then is an exemplification, by a citation of case histories, of the surgical practice involved and of the further experiences obtained in this method of subtotal colectomy for different types of colonic disease. The paper is suggestive rather than assertive.

A subtotal colectomy will be described (*a*) in a case of fulminating ulcerative colitis, (*b*) in a late case of multiple polyposis, and (*c*) in a case of Hirschsprung's disease.

SUBTOTAL COLECTOMY FOR ULCERATIVE COLITIS.

This very serious case of fulminating ulcerative colitis is chosen to illustrate the use of subtotal colectomy in a very bad operative risk. In this case it will be seen how, by the exercise of patience and by the contrivance of a "sliding scale" type of operation, a subtotal colectomy was carried out in the treatment of a patient who was almost moribund and whose bowel tissues were œdematous and swollen, profoundly devitalized and reeking with infection.

A female patient, aged forty years, had been ill for a period of six months, during which she suffered from a progressive deterioration of her general health, a severe secondary anæmia which did not respond to treatment, and prolonged attacks of severe diarrhœa.

A five-day attack of acute diarrhœa was associated with some ill-localized right-sided abdominal pain and tenderness, which led to an emergency operation in the belief that she was suffering from an attack of acute appendicitis. A greatly enlarged and inflammatorily infiltrated appendix was found. No misgiving was felt that it was not a case of acute appendicitis.

Three days after the operation the patient began to have frequent loose motions, to pass with the motions large quantities of bright blood, and to suffer from severe general abdominal pains, the incidence of which seemed to be on the left side of the abdomen.

After a month she was so emaciated, anæmic (her hæmoglobin value was 40%) and so ill that she was kept alive only by repeated transfusions of blood.

The region of her large bowel was diffusely tender, and a barium clysma disclosed a small rectum and a rigid tube-like colon with no haustral markings.

Sliding-scale staged subtotal colectomy was undertaken.

Step 1: Under gas and oxygen anæsthesia, a mid-line subumbilical incision was made. The colon from the caecum to the lower part of the sigmoid was uniformly white, opaque, thick and rigid; it had all the characteristics of an advanced stage of acute ulcerative colitis.

The ileum was severed at a point four inches from the ileo-caecal junction. The distal cut-end was sutured into a stab wound in the right iliac fossa. The proximal cut-end was implanted in the lower end of the subumbilical incision and, by two rows of sutures, was given an attachment to the lowest part of the sigmoid and the recto-sigmoid junction. The sigmoid was then divided at such a level that the lower segment would just reach the lower angle of the wound and lie side by side with the proximal segment of the ileum. The upper sigmoid-end was implanted in the upper end of the subumbilical incision.

The disposition of the patient's intestine now was: She had a left-sided enterostomy (rational surgical treatment for ulcerative colitis). The terminal part of the ileum was applied to the lowest part of the sigmoid and recto-sigmoid junction in such a way that a recto-ileal spur was made, the crushing of which through the bowel openings in the lower angle of the wound would make an anastomotic connexion with the rectum.

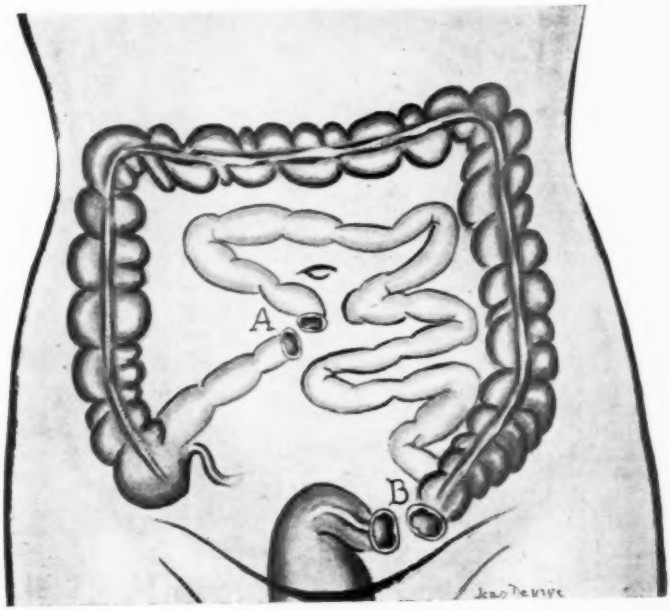

FIGURE I. A = divided ileum; B = divided sigmoid.

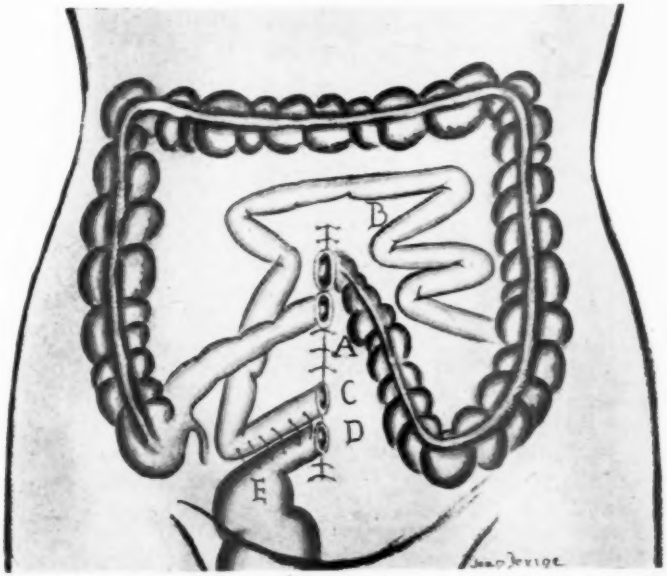

FIGURE II. A = distal end of the ileum; B = distal sigmoid; C and D show the ileo-sigmoid spur made up of proximal end of ileum and distal end of sigmoid; E = rectum.

And the colon (except the small residual segment) was completely excluded, its ileal opening being in the right iliac fossa (shown in illustration in the upper angle of wound), and its sigmoid opening in the left iliac fossa. (Figures I and II.)

The excluded colon was cleared of fæces, lavaged and chemotherapeutically treated.

In a month the general condition of the patient was greatly improved; she still had considerable pain and tenderness over the colonic region; pus and blood, teeming with enterococci, but containing few bacilli (possibly as a result of chemotherapy), were pouring from the sigmoid end of the excluded colon.

Step 2: In the patient's bed, an aluminium spur clamp (Figure III) was applied, and with this the spur was deeply crushed.

This deep "by-pass" into the rectum (in this case not very badly affected) permitted the natural passage of much of the intestinal contents, thus lessening the number of dressings and eliminating the excoriation of the abdominal wall inseparable from a fully functioning enterostomy.

FIGURE III. Aluminium alloy quickly acting spur clamp with transverse axis.

Step 3: A few weeks later, under local anæsthesia, the ileal and sigmoid ends in the lower angle of the wound were isolated and closed in layers and the abdominal muscles were loosely sutured over them. Figure IV shows these ends closed.

In the case of this very sick woman some months were allowed to elapse. She now had about six motions a day with little or no tenesmus, pus or blood; they were fluid small-intestinal motions. From her completely excluded colon came large quantities of pus, but no blood. The mucous fistulæ from the ends of the excluded colon required little dressing. She was comparatively comfortable. The excluded colon was chemotherapeutically treated. Soon she began rapidly to improve until in a few months the final step, the removal of the isolated colon, could be contemplated without undue anxiety.

It is appropriate to digress here to state that little difficulty, as a rule, is experienced in carrying out this third step—that is, in closing these openings and making the patient comfortable. For this there are several reasons. The deeply cut septum means that the rectum fills with fæces. The end of small bowel is always easy to close because of its flexible wall and wealth of peritoneum. And the cut end of bowel affected with ulceration will almost close naturally because the inflammatory process fixes the mucous membrane and prevents that prolapse and eversion of this layer which occur in normal

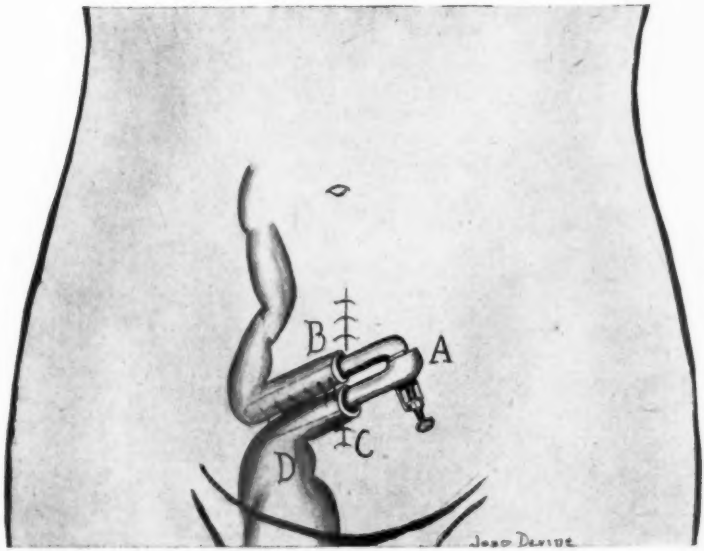

FIGURE IV. A = clamp, made of hard aluminium alloy, in position to crush the spur; B = ileum; C = sigmoid; D = rectum.

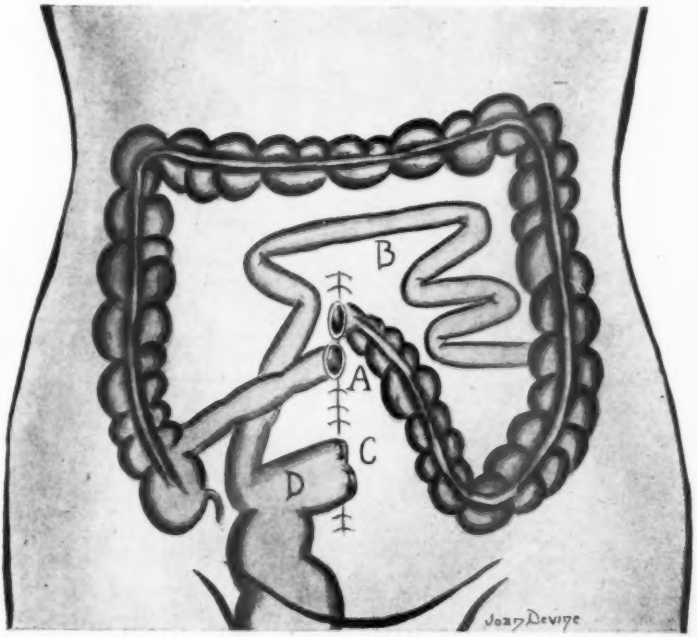

FIGURE V. A = openings of excluded bowel; B = ileum; C = closed ends of the ileum; D = lower segment of the sigmoid.

bowel and which so appose the mucous membrane surfaces that natural healing cannot take place.

At the end of this step 3, the ileum stands connected to the rectum and the patient (*a*) has incurred little danger or disturbance, (*b*) his ileum empties perhaps about from four to six times a day under rectal control, (*c*) his colon is completely out of action, its mucous fistulæ require little dressing, and its mucous surfaces can be subjected to chemotherapeutic action, and (*d*) the rectum and small segment of the sigmoid are easily accessible from the rectum for medication. Thus the patient is reasonably comfortable, can attend to himself, and the diseased bowel is under circumstances which ensure his rapid improvement.

The position then is that the patient may remain for an indefinite time at this stage. His progress will be the guide. This is easy to estimate. His general condition is obvious: the local condition of the colon can be gauged from the amount of pus and from its infectivity. As a matter of fact, I have patients at this stage who are going along comfortably. When I shall remove their colons, I do not know. If their colons got better, I could easily reconnect them with the enterotome, but what meagre experience I have had tells me that they do not.

To return now to the operation case which I am describing. When I felt that this very sick woman's condition had so improved that she could stand the removal of her colon, I undertook stage 4.

Stage 4: The final step in the surgical treatment, the removal of the excluded colon, was carried out under nitrous oxide gas and oxygen anæsthesia. The operation presented little difficulty. Both ends of the colon were exposed. The mesentery was severed close to the bowel. Vessels were ligated in a small Spencer Wells grip. Bare areas were closed as the colon was removed. The time taken was about forty to fifty minutes. Some intravenous therapy was needed after the operation.

Figure VII is a colour picture of the specimen showing the colon slit open. The lumen of the colon shows the mucous membrane uniformly involved from the ileo-caecal valve to the cut-end of the sigmoid. It is of a ripe mulberry colour, greatly thickened, and pitted with pin-point ulcerations. The muscle and peritoneal layer show extensive chronic inflammatory infiltration.

This patient still retains a small fraction of the sigmoid (just enough to reach the pubis). The rectum was not badly involved.

Three years later this patient came for examination. Some months after the operation, she said, her health had greatly improved. She had gone back to her work as a teacher. Soon her bowels acted without any distress only four times in the day. Her motions contained no blood or pus. Latterly she had some pain in the left iliac fossa. Sigmoidoscopic examination (by Mr. John Devine) showed (*a*) that in the previously diseased area in the small residual sigmoid segment and in the upper part of the rectum the mucous membrane had resumed its normal appearance, (*b*) that this area was sparsely studded with tiny indolent-looking ulcers, and (*c*) the interesting observation that when the sigmoidoscope was passed into the ileum some tiny ulcers dotted the mucous membrane of its last few inches: the ulceration had extended into the ileum, but only lightly.

Experience of the safety and efficacy of subtotal colectomy in these cases as compared with other surgical measures is in the making. Sufficient time has not elapsed to allow a judgement to be formed. Some of the patients are still *en route* for subtotal colectomy: they are fairly well with an isolated colon. I have had one catastrophe: a loop of bowel became strangulated under the lower part of the ileum where it was implanted into the right iliac fossa. I now implant this ileal end in the mid-line. It seems that no surgical measure short of removal of the colon and rectum will cure certain types of ulcerative colitis. In these types I have removed the colon after a four-year-old enterostomy, and have found that even with the enterostomy perforation had occurred and that the ulcerative colitis had not abated.

In these cases of ulcerative colitis, medical treatment has little value. One physician said that in his practice in one year four patients with ulcerative colitis had died from perforation alone.

Patients with this type of ulcerative colitis who come to the surgeon come far too late; on general surgical principles they are really too bad to be operated on.

From what experience I have had I would venture these thoughts:

1. It should be recognized that there is a type of ulcerative colitis for which medical treatment offers no hope of cure.

2. Patients suffering from this type should come early to the surgeon.

3. When these patients come to the surgeon he should recognize that nothing but removal of the colon, and perhaps of the rectum, will cure it.

4. An early stage sliding-scale subtotal colectomy may offer: (*a*) the best prospect short of removal of colon and rectum; (*b*) certainly the most comfort (there is not the misery of a permanent enterostomy); and (*c*) for the curative effect obtained certainly the least operation mortality rate.

SUBTOTAL COLECTOMY FOR MULTIPLE POLYPOSIS OF THE COLON AND RECTUM.

In multiple polyposis of the colon and rectum important considerations are: (*a*) the great number and wide distribution of the polypi over the colon and rectum make it impossible to deal with them by local excision; (*b*) one or more of these growths may be the subject of malignant degeneration; and (*c*) polypi in the rectum present almost a separate problem, because while the sacrifice of the colon may be justified to stop bleeding, to cure ill health and to assure against malignant degeneration, the loss of the rectum and the consequent incontinence are perhaps an unwarranted price to pay for the possibility of the incidence of malignancy in a small number of polypi.

In such circumstances it would seem that a compromise might be regarded as practical surgery, the compromise being subtotal colectomy having as its object the radical removal of the great majority of the polypi, and local excision to get rid of those in the lower part of the sigmoid and rectum, which are often few in number and which are accessible after incision of the posterior wall of the rectum, or to the sigmoidoscope diathermy snare.

This method of subtotal colectomy which is, of course, not applicable in all cases of polyposis, is illustrated in the following case history. In this case a rather liberal amount of the lower part of the sigmoid was preserved because the lower part of the sigmoid could be cleared of polypi, by use of the sigmoidoscope from above at one stage of the operation.

The case was that of a child of fourteen years, who had had an intussusception eight years previously, and who, since then, had been passing blood and mucus by the rectum. She was anæmic (hæmoglobin value 40%), frail and greatly debilitated from the continuous bleeding over such a long period. She was the poorest possible surgical risk.

The stages of the operation were much the same as in the first case except that a longer segment of the lower end of the sigmoid was left. In brief, these stages were:

First stage: A subumbilical mid-line incision was made; the sigmoid was divided about six inches from the recto-sigmoid junction; the ileum was divided about six inches from the ileo-caecal junction; the proximal end of the ileum was sutured side by side with the distal segment of sigmoid so as to make a spur (Figure VI); the distal ileal-end and the proximal sigmoid-end were implanted into upper angle of the wound. The excluded colon and the isolated lower part of the sigmoid and the rectum were cleaned and prepared by the elimination of the fæces and by the use of chemotherapy.

Second stage: The polypi were locally removed from the now empty and prepared lower end of the sigmoid and the rectum. This was accomplished by using the sigmoidoscope from below and above and by dividing the pedicles of the polypi with a diathermy loop (cutting current). (See Figure VI.)

Third stage: When all the polypi were removed the spur was crushed and some days later the open ends were closed under local anæsthesia.

Fourth stage: In the case of this very sick child the fourth stage, the removal of the colon, was the dangerous one. Since the colon had ceased to function and had retracted, bleeding from its contained polypi had ceased. She was therefore allowed a period of time in which to build up her own blood cells and blood volume and to

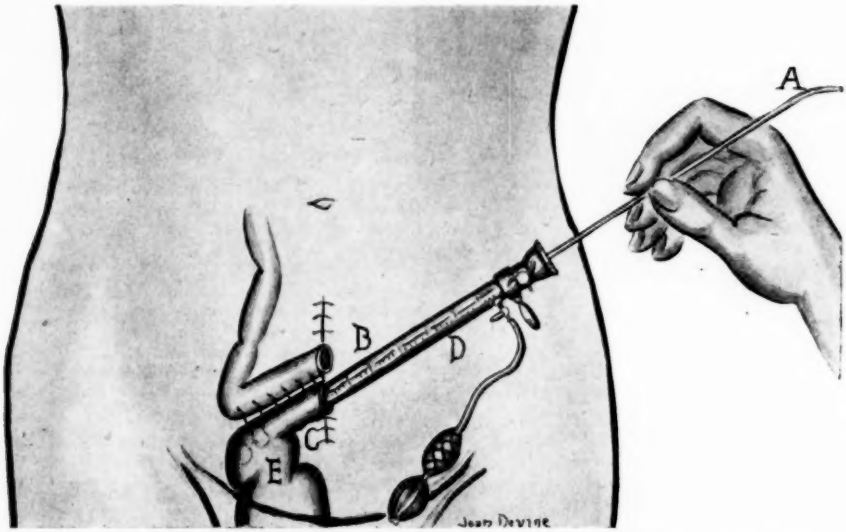

FIGURE VI. A = diathermy snare carrying cutting current; B = distal cut end of ileum; C = residual segment of sigmoid; D = sigmoidoscope; E = rectum.

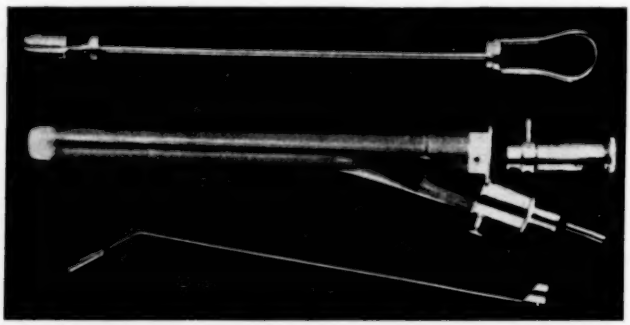

FIGURE VIII. Sigmoidoscope with transparent and non-conducting walls used for the removal of polypi from the rectum in conjunction with diathermy snare.

recover from her years of bleeding. In addition, she was further prepared by direct transfusions. And standing ready, too, during the operation were all requisites for a direct transfusion, which was designed rapidly to lift the blood pressure in case of any sudden circulatory failure. Nitrous oxide and oxygen were the anæsthetic agents.

The removal of the colon was approached first from the caecal end and then from the sigmoid end; removal of the splenic flexure, the most difficult part of the operation, was made the last stage of the operation so that the bowel could be pedicled and thus removed with the least possible disturbance. It was just while this was being done that

FIGURE VII. Shows resected colon in Case I. The bowel has been opened so that the lumen is displayed and the mucous membrane seen (for description, see text). From below on the right are the ileum (four to five inches), the caecum and the ascending colon. Above are the transverse colon and omentum. From below upwards on the left are: a box clamp closing the divided lower end of the sigmoid, the sigmoid, the descending colon and the splenic flexure. The specimen shows a uniform involvement.

FIGURE IX. The specimen shows the resected colon in Case II. It has been opened out to display the pedicled polypi. In the middle is the ileum (from four to five inches), then comes the caecum crowded with polypi, after this is the ascending colon, the hepatic flexure and the rest of the colon as far as a point in the sigmoid about five inches from the sigmoid, which is at the upper and left side. (Colour photograph taken by Julian Smith, senior.)

the patient became pulseless. A speedy restoration of her blood pressure became imperative. In a few minutes I became conscious that Dr. Julian Smith, senior, who was standing by, had quickly linked a donor to the patient's leg and in six minutes she had received more than a pint of blood. Almost at once her empty vessels filled, her condition improved, bleeding began to occur, and the operation was finished without further anxiety. This rapid direct transfusion, I feel, was a crucial factor in the success of the operation. Recovery after the operation was uneventful. A Dufay colour photograph taken by Dr. Julian Smith, senior, shows the specimen removed (Figure IX).

Twelve months later this patient was seen by Mr. John Devine for the sigmoidoscopic removal from the rectum and lower part of the sigmoid of any polypi that might have been left. For this he used a special form of sigmoidoscope, the walls of which conduct light but not electricity (Figure VIII).

His report was that the patient looked healthy and well, had had no bleeding, had gained a stone in weight, and had only one small polypus, which he snared off with the diathermy loop.

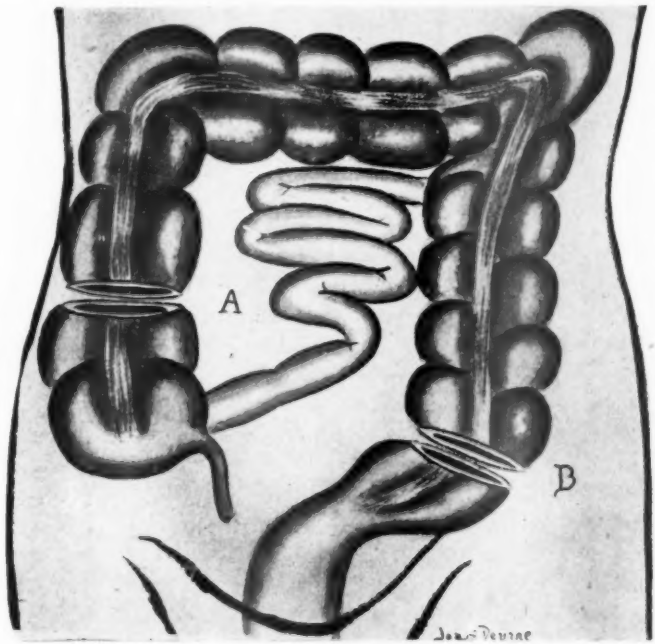

FIGURE X. Hirschsprung's disease. A = division of ascending colon; B = division of sigmoid.

SUBTOTAL COLECTOMY FOR HIRSCHSPRUNG'S DISEASE.

In Hirschsprung's disease the pathological conditions are such that a subtotal colectomy can be carried out in a simple and direct way. In this condition the great redundancy of the colon permits the use of the beginning of the caecum and the end of the sigmoid for the purpose of establishing a spur-and-enterotome anastomosis.

The following case history exemplifies the technique, and illustrates the results of a subtotal colectomy carried out on a patient who suffered from Hirschsprung's disease.

The patient was a female, aged twenty-two years. When she was ten, she became ill with symptoms and signs which her doctor thought were caused by acute appendicitis. Operation disclosed a normal appendix.

Soon after the operation she began to have what she called "attacks". Her description of these "attacks" was that they would last about three weeks. An attack would begin with severe colicky pain, which would double her up, was felt mostly in the left side of the abdomen and was somewhat relieved by enemata. She would become almost completely constipated, repeated enemata giving only the smallest bowel action. A round hard lump would form on the left side of the umbilicus and this could be felt through her dress. There was no tenderness or rigidity in the vicinity of the lump. In short, her description was that of severe large-bowel obstruction.

When she was examined a smooth, round, hard, movable lump could be felt in the region of the sigmoid.

An X-ray examination revealed a colon that had all the appearances of Hirschsprung's disease, a large round fæcolith (the lump that could be felt in her side), and some rather large diverticula in the upper part of the descending colon.

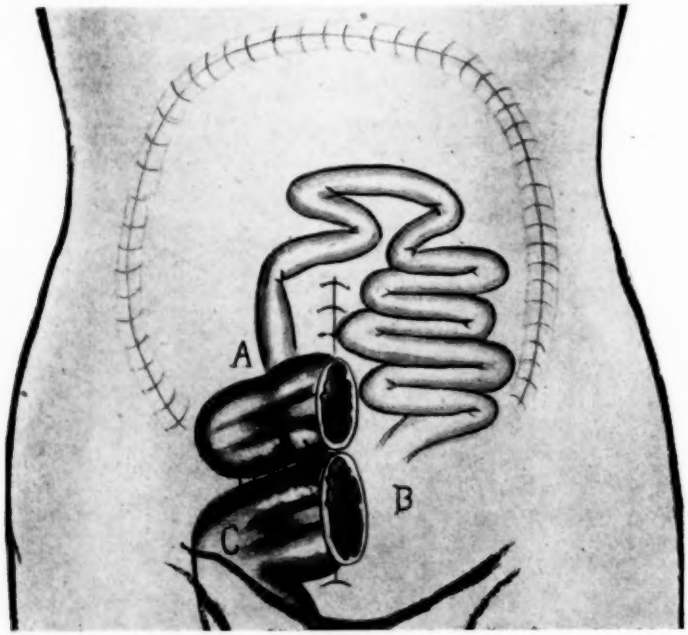

FIGURE XI. A = lower ileum with first three inches of caecum; B = last three or four inches of sigmoid; C = recto-sigmoid junction.

Operation disclosed an enormous dilatation of the whole colon and at the lower end of the dilated sigmoid a large hard round fæcolith. The fæcolith was so large and firm that it would seem impossible that it, or one like it, could pass through the part of the bowel above which it lay.

The following were the steps of the operation.

1. Division of the sigmoid between box clamps three inches above the recto-sigmoid junction (Figure X).

2. Resection of the colon, step by step (bare areas were covered as the resection proceeded), till the region of the caecum was reached.

3. Section of the bowel, between clamps, a few inches above the beginning of the caecum (Figure X).

4. Mobilization of the caecum so that it could be brought over to the lower end of the sigmoid, to which it was united by a double layer of sutures so as to form a spur (Figure XI).

5. Obliteration of a gap, which was left between the lower end of this spur and the posterior abdominal wall, by suturing the parietal peritoneum to the lower end of the spur.

6. Suture of the parietal peritoneum and the wound around this double-barrelled stump.

7. Crushing of the spur in ten days. A long spur-clamp was used in order to secure a long anastomotic union. After the deep crush most of the fæces passed by the rectum. (See Figure XII.)

8. Closure of the ends of the bowel and interment of the closed ends under the muscles and skin (local anæsthesia).

The patient suffered scarcely any shock. Convalescence was uneventful. She left the hospital in six weeks with her wounds completely healed. She had a normal daily bowel function without aperients—a great contrast to her previous condition in which, with every form of treatment, her bowels could be made to act only about once every week or ten days.

When seen eighteen months later she still had a daily bowel action without any aperient.

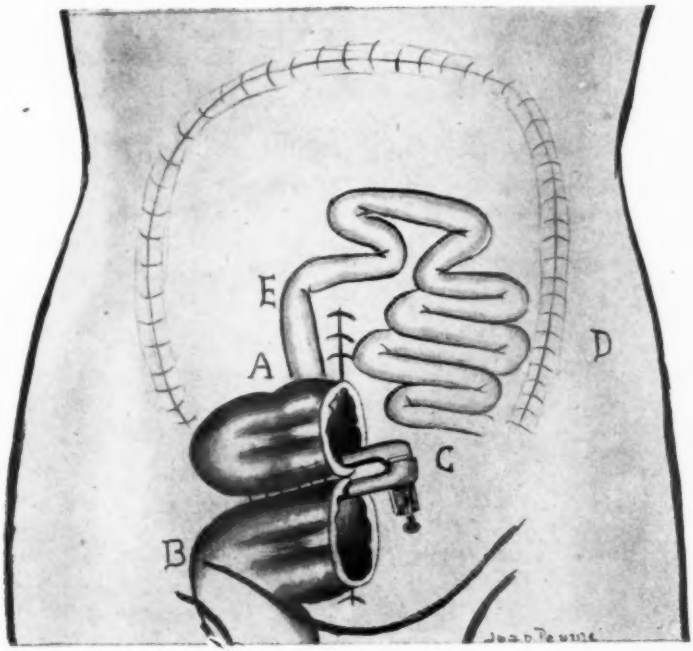

FIGURE XII. Hirschsprung's disease. A = stump of caecum and ascending colon; B = stump of sigmoid; C = clamp; D = site of resection of the colon; E = ileum.

Out of the experiences in this case arise some points.

1. The small segments of the colon, which were retained and used to make an isthmus to connect the small intestine to the rectum, did not take from the complete success of the operation. Only further experience with this form of operation in cases of Hirschsprung's disease or megalocolon will show if this result can be consistently obtained.

2. In this patient, who was in good condition, the removal of an armful of colon caused surprisingly little shock.

3. The retention of the ileo-caecal valve is undoubtedly an advantage.

4. The connexion of the small bowel to the rectum through the medium of a colonic isthmus caused little disturbance to the patient.

5. The dramatic and permanent result in this case is a striking contrast to the result which is usually obtained following sympathectomy. The result has been so striking that even with this limited experience I should in the future have no hesitation in using this as a treatment for cases of Hirschsprung's disease or megalocolon.

CONCLUSION.

I express the hope that I have made out a prima facie case for the use of subtotal colectomy in some serious cases of colonic disease. And as a result of the experience exposed in this paper I make the suggestion that it is not the removal of the colon that is the cause of death in total colectomy, but rather it is the method used to make the anastomosis between ileum and rectum.

REFERENCE.

(1) H. B. Devine: "A Method of Colectomy for Desperate Cases of Ulcerative Colitis", *Surgery, Gynecology and Obstetrics*, Volume lxxvi, February, 1943, page 136.

HEADACHE AND HETEROPHORIA AMONGST SOLDIERS.[1]

By HOWARD COVERDALE,
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CHRONIC or recurring headache was one of the common symptoms on account of which men paraded sick in Egypt, and many of these men were investigated at the eye department at Helwan.

The refraction was carefully estimated with the aid of a retinoscopy under a mydriatic, and spectacles were ordered when necessary. When these were prescribed, one of the factors taken into consideration in all cases was the state of muscle balance or imbalance disclosed by the Maddox rod test, and the strength of spherical lenses was often modified accordingly. The pressure of work made it impossible to investigate binocular functions and, apart perhaps from some explanation of symptoms and some advice on reading habits, no further action was taken.

Vertical phorias and cyclophorias were so rarely found that they are not included in these comments.

Bruce Hamilton,[(1)] at an Australian hospital, considered that heterophoria could, in the conditions of active service, be a common cause of headache and asthenopia, and orthoptic treatment was given with results which appeared to confirm or at least gave pragmatic justification for this view.

Another method of approach to the problem would be to make a comparison with those men who did not volunteer the complaint of headache, and this was done at my suggestion by the clerk to the eye department, Nurse M. Simpson, from the records of New Zealand troops seen at Helwan, Egypt, during a period of three years from the end of March, 1941. The records of British troops, who comprised about one-third of the patients, were not available.

Although tests were made for heterophoria, it must be stated that the result was not always recorded, and the figures, therefore, are incomplete. In spite of this, the comparison is of some interest. It will be seen that the

TABLE I.

Showing Findings among Men who Complained of Headache and whose Muscle Balance was Recorded with their Refractions.

Observation.	Men.	Percentage.
No error	415	65·3
1° esophoria	58	9·1
2° esophoria	32	5·0
3° esophoria	12	1·9
4° esophoria	17	2·7
5° or more esophoria	11	1·7
1° exophoria	39	6·1
2° exophoria	22	3·5
3° exophoria	13	2·0
4° exophoria	3	0·5
5° or more exophoria	8	1·2
Total	636	

[1] Accepted for publication on October 11, 1944.

TABLE II.

Showing Findings among Men who Made no Complaint of Headache and whose Muscle Balance was Recorded with their Refractions.

Observation.	Men.	Percentage.
No error	1,146	63·3
1° esophoria	177	9·9
2° esophoria	90	5·1
3° esophoria	56	3·2
4° esophoria	37	2·1
5° or more esophoria	47	2·7
1° exophoria	106	5·0
2° exophoria	60	3·4
3° exophoria	25	1·5
4° exophoria	18	1·0
5° or more exophoria	34	1·9
Total	1,796	

percentages of men with various degrees of error are very similar in the two groups and do not give support to the opinion that heterophoria was a likely cause of headache in these young men.

It is admitted that investigations of this kind, especially when retrospective, have their defects and limitations, and such figures could have no meaning in civil life without some reference to age and occupation.

ACKNOWLEDGEMENT.

I wish to thank Brigadier S. Kenrick, C.B.E., Director of Medical Services, Second New Zealand Expeditionary Force, for permission to publish this paper.

REFERENCE.

(1) J. Bruce Hamilton: "Orthoptics in the Field", THE AUSTRALIAN AND NEW ZEALAND JOURNAL OF SURGERY, Volume xiii, 1943, page 107.

THE RESULTS OF OPERATIONS FOR PEPTIC ULCER: AN INVESTIGATION OF CASES OVER A TEN-YEAR PERIOD AT THE ROYAL MELBOURNE HOSPITAL.[1]

By ROBERT S. LAWSON,
Major, Australian Army Medical Corps.

First Player: "I hope we have reformed that indifferently with us."
Hamlet: "O! reform it altogether."

HISTORICAL SUMMARY.

GASTRIC SURGERY began in 1881, when the first successful operation on the human stomach was performed by Billroth in Berlin. This was the operation subsequently to be known as the "Billroth Number 1". It was at that time described as a "pylorectomy", and it was performed not for peptic ulcer but for carcinoma of the stomach. Billroth had practised the operation many times previously on dogs.

Later in the same year, Wölfler, working with Billroth, attempted to repeat this performance in another case of gastric carcinoma. However, he found the growth fixed and irremovable, and was about to close the abdomen, when his assistant Nicoladoni suggested a short circuit to the jejunum to circumvent the obstruction at the pylorus. Wölfler agreed. He brought a long loop of jejunum up in front of the colon and anastomosed it to the anterior wall of the stomach. Thus the first gastro-enterostomy was performed almost as an afterthought.

It was a short and logical step to employ this new operation for simple pyloric stenosis, and in 1884 Rydygier performed the first gastro-enterostomy for this condition. In 1893 Codivilla performed gastro-enterostomy for chronic duodenal ulcer without stenosis, and in 1895 Doyen performed it for gastric ulcer, though the reasons for it in these conditions might not seem so obvious. It was supposed that pyloric spasm was responsible for the symptoms. In 1895 it was performed by Hartmann for hæmatemesis. The important modification of making the anastomosis to the posterior wall of the stomach and of bringing the loop of jejunum behind the colon was devised by von Hacker in 1885. Already by 1900 Mayo Robson was able to collect case records on 1,978 cases in which gastro-enterostomy had been performed.

Meanwhile other operations were being devised. In 1886 the operation now known as pyloroplasty was first performed by Heineke and later by Mikulicz. A further development of this more direct attack was the gastro-duodenostomy of Finney, first described in 1902. The "unilateral pyloric exclusion" of von Eiselberg was first devised and practised by him in 1895. The first simple resection of a gastric ulcer was performed in 1881 by Rydygier, who successfully resected a large ulcer from the posterior wall of the stomach. This became a standard method of treatment for lesser curve gastric ulcer, with or without the addition of a gastro-enterostomy. But the original pylorectomy, now developed into a "partial gastrectomy", came to be

[1] Investigation commenced during the tenure of the G. A. Syme Scholarship for 1939; accepted for publication on October 25, 1944.

commonly employed for these ulcers, the basis of the modern operation being the technique of Pólya, first published by him in 1911.

The preliminary catalogue of gastric operations can be concluded by a mention of the first successful treatment of a perforated peptic ulcer by oversewing which was performed by Mikulicz in 1884. In the period of 1897 to 1905, sixty-nine operations for this condition were performed at Saint Bartholomew's Hospital, London, just over half the patients surviving.

Thus the technical possibilities of gastric surgery had been almost fully explored by the early years of the present century. Of all these procedures none has been so frequently performed or so much a subject for controversy as gastro-enterostomy. With the stimulus to surgery resulting from the more accurate diagnosis possible with X-ray examination of the stomach, gastro-enterostomy became more and more popular, and by 1915 it was being performed as a routine in many parts of the world for all cases of chronic duodenal ulcer, and even for cases of dyspepsia in which no ulcer could be demonstrated. Moynihan declared: "I am an ardent and sanguine advocate of this operation [gastro-enterostomy], than which there is none in all surgery more completely satisfactory"; while Sherren gave his opinion that gastro-enterostomy "has done as much if not more for the good of the human race than any other surgical procedure". Honoured as they are in surgery, Moynihan and Sherren would find few to support these dicta today.

The first disillusionment came with the appearance of a new lesion in pathology—the jejunal ulcer. The first authentic case was reported by Braun in 1889, but no account was taken of it except as a curiosity. In 1909 Paterson reported 52 definite cases following gastro-enterostomy. At first these were regarded as due to errors of surgical technique, and Moynihan regarded 2% as a "generous estimate" of its incidence. However, jejunal ulcer and other failures of surgery were reported more and more frequently, irrespective of the technique. Eustermann in 1920 reported 83 cases following operation at the Mayo Clinic, and while Balfour, Walton, Luff and others estimated its frequency at between 2% and 4%, Hurst and Stewart believed it to be "a dangerous and frequent sequel of gastro-enterostomy", and found its incidence to be as high as 50%.

Apart from the risk of development of jejunal ulcer, the positive benefits of gastro-enterostomy seemed doubtful. Cuthbert Wallace wrote: "I believe that there is only one thing that gastro-enterostomy can cure and that is pyloric obstruction."

The effects of these disquietening facts and opinions were two. Firstly, more attention was paid to the indications for operation, irrespective of any stress on particular points in operative method and technique. Secondly, many surgeons decided to perform more radical operations (despite their higher mortality) to effect a cure. Of these, Finsterer was a leading exponent. In 1926 he wrote: "Since 1919 I have employed resection of the stomach in almost all cases which were not complicated by perforation." During that period he had performed partial gastrectomy (for gastric or for duodenal ulcer) 593 times, and gastro-enterostomy only five times.

The true merits of these various operations have not yet been clarified, and after sixty years the rightful place of gastro-enterostomy is still a matter of doubt and confusion. Many have become opposed to operation altogether (except for special complications), and suggest that a stricter medical regime is the only solution; others have sought to find a more effective operation; while between is a group of surgeons such as Wilkie, Walton, Balfour and Devine who consider that "gastro-enterostomy must still remain the basis of average gastric surgery" (Devine). It would seem that the solution can be

obtained only by a continual study of the results of different methods of treatment. As a contribution to this the following review is presented.

CLINICAL MATERIAL.

Details have been collected of all cases of peptic ulcer for which operation was performed at the Royal Melbourne Hospital over the ten-year period 1927 to 1937, and in all patients who survived operation an attempt has been made to trace the end-result.

During this period a total of 332 patients were treated by operation for peptic ulcer or its complications (but excluding perforation), and the end-result is known in regard to 239 of them. The end-result is untraced in 83 cases (25%). Cases of perforated peptic ulcer have been considered separately and over a period of five years only, except for those cases in which gastro-enterostomy was performed.

This inquiry was commenced in 1939, and the ten-year period 1927 to 1937 was chosen as the most suitable and likely to give the maximum information. In cases in which operation was performed earlier than this, the chances of tracing the patients in any worthwhile numbers seemed remote; while those operated on later than June, 1937, would not allow a sufficient follow-up period, for which a minimum of three years was considered necessary. For this purpose the following *questionnaire* was sent, with a covering note, to each of these patients:

1. Are you in good health?
2. Are you able to do your work or housework?
3. Are you dieting or taking ordinary food?
4. Are you taking powders or medicine?
5. Present weight ..... { Gaining / Stationary / Losing }
6. Do you have any indigestion pain?
7. Do you have any vomiting?
8. Have you required any further special treatment for stomach trouble since the operation?..... If so, please mention it, especially whether you have been treated in hospital again, or have required further operation.
9. As a result of the operation, do you consider you are
   (*a*) Cured? (*c*) Not improved?
   (*b*) Improved? (*d*) Worse?
10. Any further remarks?

Further efforts to trace any patients not responding were made with the help of the Commonwealth electoral rolls, while the Registrar of Deaths was able to state which of them had died in the State of Victoria and from what cause. A proportion (25%) remain completely untraced, alive or dead, and it is idle to speculate on the likely result in this group. Those patients who did respond gave explicit answers to the questions in almost all cases. The statements made in the following account have been based on these sources of information.

I. DUODENAL ULCER: OPERATIONS OF ELECTION.

One hundred and fifteen patients suffering from chronic duodenal ulcer were operated on during the ten-year period. Cases of perforation, frank pyloric stenosis and hæmatemesis (occurring at the time) are excluded from this group, as well as cases in which a cholecystectomy was also performed at the same time for coexistent gall-bladder disease. These are considered separately later.

This group therefore represents patients with duodenal ulcer uncomplicated except for chronicity and in whom surgery was not necessary at the time to save life, but was undertaken deliberately for the relief of symptoms.

CLINICAL FEATURES.

Of these 115 patients, 97 were males (84%) and 18 were females (16%). The average age was forty-three years, and three-quarters of the patients were aged between thirty and fifty-five years. Only nine were aged less than thirty years, and the condition of the one patient under twenty years of age (a girl of eighteen) must be regarded with scepticism. Although this patient was described at operation as having a "chronic duodenal ulcer", the symptoms were of only eight weeks' duration. The oldest patient was a man of seventy-one years.

The symptoms complained of were indigestion pain in all cases, vomiting in 56 cases, previous hæmorrhage, either hæmatemesis or melena or both, in 32 cases; while there was a history of a previous perforation of the ulcer in 23 cases. (In one of these two previous perforations had occurred, while three patients gave a previous history of both perforation and hæmatemesis.) The average duration of symptoms was approximately nine years; in only 15 cases was it less than three years, while in 16 it was more than fifteen years.

X-RAY FINDINGS.

A record of the findings on barium meal examination was given in respect of 81 patients. In 38 cases the X-ray diagnosis was "duodenal ulcer" without further specification. In 16 others the condition was stated to be non-obstructive, while in 18 a delayed emptying of the stomach was noted. In nine cases no abnormality was detected on X-ray examination, although a duodenal ulcer was identified by the surgeon at operation. Thirty-four patients had no record of an X-ray examination having been done. Of these, 12 patients had had previous perforations, perhaps regarded as making X-ray examination superfluous. The remaining patients may have had X-ray examination performed elsewhere prior to admission to hospital, or the note-takers may have merely neglected to record the findings, but in any case there is no record of it.

TEST MEAL FINDINGS.

A record of test meal examination is given for only 39 patients. Of these, five proved to have a high "climbing" acid curve, 12 (additional) had high acid curves; in 17 cases the acid curve was within normal limits, in three there was a low acid curve, while in two there was an achlorhydria. Unfortunately there was no record of any test meal examination for the remaining 76 patients.

It will be observed that the gastric acidity was raised above normal in nearly half the cases of duodenal ulcer in which it was recorded. The descriptions of gastric acidity curves quoted conform to the commonly accepted standards of Bennett and Ryle.[1]

OPERATIVE FINDINGS.

In 60 cases the duodenal ulcer was on the anterior wall; in nine of them some scarring or stenosis was described, while in one case the ulcer was adherent to the liver. In six cases a posterior wall duodenal ulcer was described, in two of which it was stated to be adherent to the pancreas. In two cases the ulcer was on the superior border, and in four the duodenum was obscured by adhesions or omentum. In 43 cases the site of the ulcer was not described.

OPERATIONS PERFORMED.

The primary operations performed on these 115 patients are shown in Table I. The total number of gastro-enterostomies performed is 97, including

TABLE I.

Operations Performed for Duodenal Ulcer.[1]

Operation.	Number of Cases.
Posterior gastro-enterostomy	65
Posterior gastro-enterostomy *plus* entero-enterostomy	4
Posterior gastro-enterostomy *plus* infolding of ulcer	20
Posterior gastro-enterostomy *plus* excision of ulcer	3
Posterior gastro-enterostomy *plus* temporary pyloric occlusion	5
Pyloric exclusion (Devine's operation)	4
Pyloroplasty	3
Gastro-duodenostomy	5
Partial gastrectomy	1
Excision of ulcer, only	4
Infolding of ulcer, only	1
Total	115

[1] In addition the appendix was removed from 25 of these patients at the same time, in most cases as a routine precautionary measure.

cases in which various additional procedures were undertaken, but not including those in which the pyloric exclusion operation was performed. The 115 primary operations were performed by 16 different surgeons. Nearly three-quarters of them were performed by five surgeons.

Secondary Operations.

In 13 cases a second operation was performed (either within the ten-year period or subsequently up to 1939) as follows:

Pyloric exclusion (Devine's operation) (three after gastro-duodenostomy and one following pyloroplasty)	4
Partial gastrectomy (one after gastro-duodenostomy and one for jejunal ulcer)	2
Anterior gastro-enterostomy (in a patient for whom a posterior gastro-enterostomy had previously been performed)	1
Entero-enterostomy (after gastro-enterostomy)	1
Excision of lesser curve gastric ulcer (in a patient previously treated for duodenal ulcer by gastro-enterostomy)	1
Restoration of normal anatomy (all for jejunal ulcer)	4
Total	13

One patient had a third operation—partial gastrectomy—following restoration of normal anatomy for jejunal ulcer. In addition, two patients had operations for incisional hernia and one patient was operated on for intestinal obstruction—conditions which could fairly be described as sequelæ of the primary operation for duodenal ulcer.

NUMBER OF OPERATIONS PERFORMED IN SUCCESSIVE YEARS.

Before the results are discussed it is of interest to note that the number of operations performed in successive years generally declined, though there is no reason to believe that the incidence of duodenal ulcer is falling.

This in itself suggests a diminishing faith in the efficacy of operation. The number of primary operations performed in successive periods is shown in Table II.

TABLE II.

Operations Performed for Duodenal Ulcer in Successive Periods.

Period.	Number of Operations.
Three years to June 30, 1930	58
Four years to June 30, 1934	38
Three years to June 30, 1937	19
Total	115

RESULTS OF OPERATION.

Immediate Results.—One hundred and eleven patients survived the primary operation and there were four deaths as follows. One patient developed an obstruction following gastro-enterostomy, and laparotomy revealed a herniation of the anastomosis into the stomach. Entero-enterostomy was performed, but the patient died of peritonitis. One patient died of intestinal obstruction in the second week after gastro-enterostomy. Two patients died from hæmorrhage from the ulcer occurring within one week of gastro-enterostomy (although not suffering from hæmorrhage at the time of operation). Thus there were four deaths following gastro-enterostomy—a 4% mortality.

End-Results.—Of the 111 survivors, 93 had had a gastro-enterostomy performed and it is chiefly with these that the further discussion is concerned.

Results of Gastro-Enterostomy for Duodenal Ulcer.

The late results among 93 survivors of gastro-enterostomy are shown in Table III. There are 60 patients for whom gastro-enterostomy was performed

TABLE III.

Results of Gastro-enterostomy for Duodenal Ulcer.

Operation.	Cured.	Improved.	Not Improved.	Worse.	Died of Unrelated Illness.	Untraced.	Total.
Posterior gastro-enterostomy	10	12	8	7	5	21	63
Posterior gastro-enterostomy *plus* entero-enterostomy ..	—	1	1	—	—	2	4
Posterior gastro-enterostomy *plus* infolding of ulcer ..	9	3	3	2	1	1	19
Posterior gastro-enterostomy *plus* excision of ulcer ..	—	1	—	—	1	1	3
Posterior gastro-enterostomy *plus* temporary pyloric occlusion	3	—	—	—	—	1	4
Total	22	17	12	9	7	26	93

for duodenal ulcer, and whose end-results have been effectively traced. The results in these 60 cases are:

Cured	22 (37%)	65%
Improved	17 (28%)	
Not improved	12 (20%)	35%
Worse	9 (15%)	

Briefly stated, two-thirds of these patients were benefited by operation, and one-third were not benefited or were made worse. The average follow-up

period of these patients is over eight years and in no case is it less than three and a half years.

Standards of Cure.

It may surprise some people to learn that gastro-enterostomy can cure anything, so much is it discredited in certain quarters. It should be stated therefore that the standard of cure is as follows. The patient is in good health, free from gastric symptoms, working full time, taking ordinary food and requiring no further treatment (though an occasional dose of powder may surely be permitted to any mortal!) The "cures" herein recorded conform to the above standard and do not depend alone on the patient's bald statement that he is "cured". Three cases may be quoted to convince the sceptical.

G.H., aged twenty-seven years, with a history of dyspepsia for three years and a perforation of a duodenal ulcer one year prior to his gastro-enterostomy, is in good health eight years after operation. He weighs thirteen stone and has been entirely free from symptoms. He states that he has "worked boiler making ever since with exception of two operations, right and left hernia (that is, inguinal), without holiday". He eats what he likes and takes powder irregularly.

J.J., aged forty-eight years, with a history of dyspepsia and vomiting for twenty years, has worked for four years as a farmer since his gastro-enterostomy, has had no further treatment, takes no medicine or powder, and writes: "I am really splendid and have not had a moment's pain. I was careful with my diet for about six months, then just did not worry about dieting, although I keep away from condiments; but I have never been keen on them."

M.H., aged fifty-eight years, had suffered from pain and vomiting for more than ten years at the time of his operation. A gastro-enterostomy (with temporary pyloric occlusion) was performed in 1933 for duodenal ulcer of the anterior wall. In 1940 he was in good health, working full time, taking ordinary food and no powder, and entirely free from symptoms. When he received the *questionnaire* he sent a postal note to the hospital and a walking-stick to the surgeon, with many protestations of gratitude.

The average follow-up of the 22 patients "cured" is over nine years and in no case less than four years.

The "improved" group includes cases of near-cure and also some patients whose improvement is plainly relative. No patient is included who has not declared his condition to be improved, while a few whose conclusions seemed generously biased (judging from the other answers to the *questionnaire*) have been relegated to the "not improved" class. For example, a patient writes: "Had a hæmorrhage in 1938, was off work for three months. Had perfect health for five years after operation, then pains started to come again. Since then have been only fair." The patient declared himself "improved", but is placed in the "not improved" group nevertheless.

The "not improved" group includes all those who have had such setbacks and all those who still require to attend their doctors regularly and generally follow the same regime which they found necessary prior to operation.

Finally in the group labelled "worse" are patients all of whom developed a jejunal ulcer.

The above criteria in regard to the end-results apply to all cases throughout this review.

Factors Influencing Prognosis.

If it is established that gastro-enterostomy will cure some patients suffering from duodenal ulcer while it is undeniable that others are made worse, then it is plainly of paramount importance to be able to distinguish the two groups of case before operation is undertaken. With this in mind a comparison has been made of all available details of the 60 fully traced patients, and particularly of the 22 patients cured as against the nine patients

who developed a jejunal ulcer. The various factors considered are set out in order.

Variations of Operation.—Among the 22 "cures" there were 10 patients who had had gastro-enterostomy only, nine in whom infolding of the ulcer was performed as well, and three in whom temporary pyloric occlusion was added. It is tempting to suppose that the infolding of ulcer improved the results (nine patients cured out of 17 traced), but it must be stated that of the nine jejunal ulcer patients two had an infolding of ulcer performed, the remainder a simple gastro-enterostomy. The three "cures" traced out of four patients in whose treatment temporary pyloric occlusion was added (the remaining patient being untraced), do not permit any sweeping assertions to be made when the numbers are so few. Moreover, it can be stated that appendicectomy (performed altogether in 24 cases) is no guarantee of an improved result. Though there are five "cures" in this number, there are also four patients who developed jejunal ulcer. The appendicectomy *per se* appears to have had no material relation to the cure of the primary condition.

Results of Different Surgeons.—It was stated earlier that five surgeons had performed about three-quarters of the gastro-enterostomies, and it might be expected that their results would be better than average. Of the 43 patients operated on by these five surgons (out of the total of 60 effectively traced), 18 were "cured", that is, 42% (or "cured" + "improved" = 70%)—slightly higher figures than the general. But as eight others of these 43 patients developed jejunal ulcer (19%), it would seem that the underlying pathological change is a more potent factor in determining the result than the excellence of the surgeon.

Symptomatology.—There is no material difference in the two groups in average age, in average duration of symptoms prior to operation, or in sex distribution (the 22 patients cured included two women and the nine with jejunal ulcer—two).

There was a previous history of perforation of the ulcer (that is, prior to gastro-enterostomy) in seven of the cured cases and in two with jejunal ulcer. A history of previous hæmorrhage was given by seven patients cured and by one with jejunal ulcer. A study of all cases in which previous perforation or hæmorrhage had occurred, failed to reveal any relationship between either of these complications and the eventual prognosis after gastro-enterostomy. The detailed analysis in relation to the various factors considered above is omitted, but it can be said that no distinctions can be made on any of these grounds.

Pathology.—There remain to be considered such features of the pathology of the duodenal ulcer as its type and situation as described at operation or as may be inferred from the evidence of the X-ray examination and from the test meal.

Regarding the site of ulcer, of the 60 "fully traced" patients after gastro-enterostomy, 33 had an anterior wall ulcer described at operation; of these, 12 were cured and four developed jejunal ulcer. A detailed analysis does not indicate that an anterior situation of the ulcer is likely to confer either a better prognosis or a worse. These cases do not, however, include those in which stenosis was described. Concerning the posterior wall ulcers, as there were only three definitely described, no conclusions could be drawn. (No description of the site of the ulcer is given in 17 of these 60 cases.)

Cases with Evidence of Stenosis.—It is worth noting, however, that in the seven cases in which the ulcer was described at operation at stenosing, cure resulted in five cases and improvement in two others. If all cases in which there was evidence of stenosis (either radiological or described at

operation or both) are considered together, the total number of them is 14. Among these, nine patients were cured, three had their condition improved and two not improved. This suggests that the prognosis after gastro-enterostomy for duodenal ulcer is better when some degree of stenosis exists.

Gastric Acidity.—Finally, in regard to the degree of gastric acidity as revealed by test meal, this information was given by 22 patients out of the 60 "fully traced" patients after gastro-enterostomy. The relationship of prognosis following gastro-enterostomy to the degree of gastric acidity before operation is set out in the accompanying correlation diagram. The diagram

Correlation Diagram, illustrating the relationship of prognosis after gastro-enterostomy to the degree of gastric acidity prior to operation for duodenal ulcer. Degree of gastric acidity prior to operation according to the "acid curve" obtained by test meal examination.

Result of Gastro-enterostomy after a Three–Thirteen Year Period.	Type of Curve.				
	High "Climbing".	High.	Normal.	Low.	Achlorhydria.
Cured			◆ ◆ ◆	◆	◆
Improved		◆ ◆	◆		◆
Not improved	◆ ◆ ◆	◆ ◆ ◆	◆ ◆ ◆		
Jejunal ulcer	◆ ◆	◆	◆		

explains itself, each dot represent one case, and though the total figures are small (22), a definite relationship can be observed. When gastro-enterostomy is performed in the presence of a high acid and especially a high "climbing" curve, the prognosis is likely to be poor, while all patients cured had an acid curve which was normal or low.

Results of Other Operations for Duodenal Ulcer.

Concerning the operations other than gastro-enterostomy which were performed little can be said.

Gastro-Duodenostomy.

Gastro-duodenostomy was performed five times; in two cases it was combined with excision of an anterior wall duodenal ulcer, in one with cautery of a posterior wall ulcer. In four of these cases the patients have submitted to further operations because of persistence of symptoms. Devine's pyloric exclusion operation was performed in three instances and a partial gastrectomy in the fourth. The condition of the remaining patient after gastro-duodenostomy is "not improved" ten years later; the patient is still suffering from dyspepsia and having medical treatment.

Pyloroplasty.

Pyloroplasty was performed three times only. In one of these a further operation (Devine's) was performed a year later when a recurrence of the duodenal ulcer was observed. The two remaining patients could not be traced.

Pyloric Exclusion.

Pyloric exclusion (Devine's operation) was performed four times as the primary operation. Three patients were "improved" but not cured, while the fourth is untraced.

In four other cases this operation was performed as a secondary procedure after failure of a previous operation (pyloroplasty in one and gastro-duodenostomy in three). In three of them a recurrence of duodenal ulcer was described. In these four cases the patient who previously had a pyloroplasty is still suffering pain and is under medical treatment ("not improved"). Of those patients who previously had a gastro-duodenostomy two were "not improved"—one had a melena a year after the (second) operation and the other died three years later after an attack of copious vomiting. (In both these cases the distal third of the stomach was resected, while in the remainder of the eight pyloric exclusion cases no resection was done.) The third patient with pyloric exclusion (after gastro-duodenostomy) is back at work free from symptoms and after three years regarded himself as cured.

Partial Gastrectomy.

Partial gastrectomy was performed as the primary operation for duodenal ulcer in one case only. The patient's condition was not improved and he has been back in hospital with pain and vomiting. A second patient submitted to gastrectomy three years after gastro-duodenostomy had failed to give relief; a recurrence of duodenal ulcer was noted. His condition is improved, but he is still dieting and requires alkaline powders.

Simple Excision.

Simple excision of duodenal ulcer was performed in four cases only. Three patients were untraced and one describes himself as cured. In one case a simple infolding of ulcer was performed without other procedure; this patient is untraced.

The secondary operations which were performed for jejunal ulcer are considered separately later.

DUODENAL ULCER WITH CHOLECYSTITIS.

There were ten patients with duodenal ulcer and cholecystitis operated on in the ten-year period, and they have not been included in the previous series. They comprised six males and four females, with an average age of forty-nine years. In all cases a duodenal ulcer and cholecystitis were found together at operation, while six of the patients had gall-stones. In one case the duodenal ulcer was adherent to the liver and in another it was adherent to the gall-bladder.

At operation the gall-bladder was removed in all cases, gastro-enterostomy was performed in eight, pyloroplasty in one and simple infolding of the ulcer in one. On patient died from operation and nine survived. Of these, three were cured (two with gastro-enterostomy), the condition of three was improved (two with gastro-enterostomy), and three are untraced.

II. GASTRIC ULCER: OPERATIONS OF ELECTION.

One hundred and twenty-six patients suffering from chronic gastric ulcer were operated on during the ten-year period. These also were operations of election, as in the previously considered duodenal ulcer cases, with the important difference that in a number of them the possibility of carcinoma was suspected and to this extent operation became an imperative matter.

CLINICAL FEATURES.

Of these 126 patients, 103 were males (82%) and 23 females (18%). The average age was forty-eight years, only seven patients being aged under thirty.

The youngest was a man of twenty with a prepyloric ulcer. Twenty-six patients were aged over sixty years and the oldest was a woman of seventy-three years with a large penetrating lesser curve ulcer. The symptoms complained of were dyspepsia (all cases), vomiting (81), previous hæmorrhage (35), and previous perforation (13). In one patient two perforations had occurred and in two patients perforation and hæmorrhage had both occurred previously. The average duration of symptoms was seven years; in 32 cases it was less than three years, in 18 more than fifteen years.

X-RAY FINDINGS.

A record of the X-ray findings on barium meal examination was given in 106 cases. In 47 cases a lesser curve gastric ulcer was diagnosed by this means, and in 25 a pyloric or prepyloric ulcer was diagnosed. Twelve patients were diagnosed as suffering from "duodenal ulcer", and in 20 cases carcinoma was suspected on X-ray examination (either pyloric or lesser curve), though in all these cases the surgeon identified a chronic gastric ulcer at operation. In two cases no abnormality was found on X-ray examination, in both of them a high lesser curve ulcer being present. In 30 of all the above cases there was radiological evidence of obstruction or delay in emptying. In 20 cases there was no record of X-ray examination.

TEST MEAL FINDINGS: GASTRIC ACIDITY.

Gastric acidity was recorded in only 53 cases, and two of the patients had high "climbing" acid curves, nine (additional) had high acid curves, 16 had a gastric acidity within normal limits; in 11 cases the acid curve was low and in 15 there was an achlorhydria. There was no record of test meal examination in 73 cases.

It will be observed that in the cases of gastric ulcer in which the gastric acidity was recorded, it was below the accepted normal in about half and above the normal in only about one-fifth of cases.

OPERATIVE FINDINGS.

In 69 cases there was an ulcer of the lesser curvature in the region of the *pars media* or proximal to it. Of these ulcers, 26 were stated to be situated posteriorly, 19 being adherent to the pancreas and four to the liver. In 55 cases the ulcer was pyloric or prepyloric in situation. In two cases two ulcers were described, one prepyloric and one at the lesser curve.

In the table of operations (Table IV) the ulcer type is stated together with the operation performed (taking the two main subdivisions of "prepyloric" and "lesser curve" ulcer).

OPERATIONS PERFORMED.

The operations performed are shown in detail in Table IV. The total number of gastro-enterostomies performed was 62—that is, including cases in which various additional procedures were performed but not including the pyloric exclusion operation. Partial gastrectomy was performed as the primary operation in 37 cases.

Secondary Operations.

In eight cases a second operation was subsequently performed on the stomach. In three of them a posterior gastro-enterostomy was added after a previous excision of lesser curve ulcer. In two cases a partial gastrectomy was performed—one after previous excision of a lesser curve ulcer and one

after failure of gastro-enterostomy to relieve symptoms. In three cases a secondary operation was performed for jejunal ulcer. These are considered separately later.

TABLE IV.

Operations Performed for Gastric Ulcer and the Situation of the Ulcer thus Treated.

Primary Operations.	Total.	Type of Ulcer.		
		Prepyloric.	Lesser Curve.	Lesser Curve and Prepyloric (Two Ulcers).
Posterior gastro-enterostomy	23	18	5	—
Posterior gastro-enterostomy *plus* temporary pyloric occlusion	2	2	—	—
Posterior gastro-enterostomy *plus* cautery of ulcer	2	2	—	—
Posterior gastro-enterostomy *plus* infolding of ulcer	6	4	2	—
Posterior gastro-enterostomy *plus* entero-enterostomy	4	4	—	—
Posterior gastro-enterostomy *plus* excision of ulcer	24	2	22	—
Posterior gastro-enterostomy *plus* excision of ulcer and temporary pyloric occlusion	1	—	1	—
Partial gastrectomy	37	9	26	2
Pyloroplasty	3	3	—	—
Gastro-duodenostomy	2	2	—	—
Pyloric exclusion (Devine's operation)	4	3	1	—
Excision of ulcer only	15	3	12	—
Infolding of ulcer only	1	1	—	—
Cautery of ulcer	2	2	—	—
Total	126	55	69	2

Appendicectomy was performed as well in four of these cases. One patient for whom gastro-enterostomy *plus* entero-enterostomy was performed also had an excision of ulcer done at the same time. Another patient with entero-enterostomy had this procedure added to gastro-enterostomy eight days later on account of vomiting. It is, however, included as a "primary operation".

Types of Operation Performed in Successive Periods.

It is worth noting that most of the gastrectomies were done in the last three years of the ten-year period, while nearly half the gastro-enterostomies were performed in the first three years, as shown in Table V. Gastrectomy appears to be increasing in popularity, while gastro-enterostomy is being done less often.

TABLE V.

Operations Performed for Gastric Ulcer in Successive Periods.

Operations Performed.	Period of Time.			Total.
	Three-year Period to June 30, 1930.	Four-year Period to June 30, 1934.	Three-year Period to June 30, 1937.	
Gastro-enterostomy (all types) ..	28	21	13	62
Gastrectomy (all types)	4	14	19	37
Total	32	35	32	99

RESULTS OF OPERATION FOR GASTRIC ULCER.

Immediate Results: Mortality Rates.

There were 19 deaths following the 126 primary operations. Five of these occurred after gastro-enterostomy, giving a mortality of 8% for all types of gastro-enterostomy (62). Three of these deaths occurred among patients who had been subjected to gastro-enterostomy only, one after gastro-enterostomy *plus* entero-enterostomy and one after gastro-enterostomy *plus* excision of lesser curve ulcer.

Eleven deaths occurred among 37 patients submitted to partial gastrectomy (30%). Three deaths occurred among 12 patients for whom simple excision of lesser curve ulcer was performed (25%).

Deaths following gastro-enterostomy resulted from bronchopneumonia (1), pulmonary embolism (1), peritonitis (1), intestinal obstruction (1); in one case the cause of death is not clearly stated (no autopsy).

Deaths following gastrectomy resulted from bronchopneumonia (6), from peritonitis (2), from recrudescence of latent pulmonary tuberculosis (1), and from post-operative shock in two cases.

Deaths following excision of lesser curve ulcer resulted from bronchopneumonia (2) and peritonitis (1).

Cases Developing Carcinoma.

Three patients of the 107 who survived operation subsequently died of carcinoma, and these may now be considered before proceeding to a discussion of the end-results of the other survivors.

The first of these three was a female patient, aged sixty-three years. The X-ray diagnosis was of a "large prepyloric ulcer". At operation the ulcer was found to be almost encircling the stomach close to the duodenum. An excision of the ulcer was performed, followed by a gastro-duodenostomy. Microscopic section of the ulcer showed "chronic inflammatory tissue". The patient died four years later, and on autopsy the anterior wall of the stomach was found to be three-quarters of an inch thick, densely adherent to the liver and regarded as the site of scirrhous carcinoma. No microscopic section was examined.

The second patient developing carcinoma was a man, sixty-three years of age. X-ray examination had revealed irregularity of the pylorus with delayed emptying, and carcinoma was suggested. At operation a chronic prepyloric ulcer was found penetrating the liver. The ulcer was separated and oversewn and a posterior gastro-enterostomy was performed. Microscopic section of portion of the ulcer excised showed inflammatory tissue. The patient died four years later of carcinoma of the stomach (Registrar of Deaths), but it is not known whether autopsy was performed.

The third patient developing carcinoma was a man, aged forty-five years. X-ray examination showed "lesser curve ulcer". At operation an excision of a lesser curve ulcer was performed followed by posterior gastro-enterostomy. There is no record of microscopic section. Five years later the patient was seen with a large mass in the epigastrium, which X-ray examination showed to be filling the pylorus beyond the stoma. The patient was cachectic and was regarded as having an inoperable carcinoma (October, 1939), but no further record of his case was traced.

It will be observed that in none of these cases is final proof of the development of malignancy available, but the evidence of it seems sufficient nevertheless.

Late Results of Operation for Gastric Ulcer.

The late results of operation for gastric ulcer can now be considered in the remaining 104 cases. Of the 104 patients, 55 had had gastro-enterostomy performed, 26 a partial gastrectomy, 12 a simple excision of ulcer, while 11 had miscellaneous operations.

End-Results of Gastro-Enterostomy.

The late results among 55 survivors of gastro-enterostomy are shown in Table VI.

TABLE VI.

Results of Gastro-enterostomy for Gastric Ulcer.

Operations Performed.	Cured.[1]	Improved.	Not Improved.	Worse (Jejunal Ulcer).	Died of Unrelated Illness.	Untraced.	Total.
Posterior gastro-enterostomy	7 (6+1)	2 (2+0)	3 (3+0)			8	20
Posterior gastro-enterostomy *plus* temporary pyloric occlusion	1 (1+0)	—	—	—	—	1	2
Posterior gastro-enterostomy *plus* cautery of ulcer	—	1 (1+0)	—	—	1	—	2
Posterior gastro-enterostomy *plus* infolding of ulcer	1 (1+0)	2 (2+0)	1 (0+1)	—	—	1	5
Posterior gastro-enterostomy *plus* entero-enterostomy	—	1 (1+0)	—	1 (1+0)	—	1	3
Posterior gastro-enterostomy *plus* excision of ulcer	4 (0+4)	9 (0+9)	—	1 (1+0)	—	8	22
Posterior gastro-enterostomy *plus* excision of ulcer and temporary pyloric occlusion	—	—	1 (0+1)	—	—	—	1
Total	13	15	5	2	1	19	55

[1] The figures in parentheses refer to cases with prepyloric and lesser curve ulcers respectively.

There are 35 patients for whom gastro-enterostomy was performed for gastric ulcer, and whose end-results have been effectively traced. (The three patients developing carcinoma are omitted.) The results in these 35 cases were as follows:

Cured	13 (37%)	80%
Improved	15 (43%)	
Not improved	5 (14%)	20%
Jejunal ulcer	2 (6%)	

Briefly stated, four-fifths of these patients were benefited by operation and one-fifth were not benefited or were made worse. The average follow-up for these patients is about nine years, while among the patients cured it was over six years in all cases except one in which the patient is traced for three and a half years only.

Factors Influencing Prognosis.—As with the duodenal cases, the above figures have been reconsidered in relation to the age and sex of the patients, the duration of symptoms and the occurrence of previous hæmorrhage or perforation; but in no case can any conclusions be drawn indicating that any of these factors is associated with a better or a worse prognosis.

Site of Ulcer: When the results of gastro-enterostomy in relation to prepyloric and lesser curve ulcer respectively are considered, it is found that they are better for the lesser curve ulcers. Of 16 patients with lesser curve ulcer (Table VI), five were cured, nine improved and two not improved. In 13 cases in which gastro-enterostomy was combined with excision of lesser curve ulcer all patients were benefited by operation.

Gastric Acidity: Details of a test meal examination are recorded in only 13 of the 35 cases of gastro-enterostomy fully traced, and no conclusions can be drawn from an analysis of so few. It must be stated, however, that among the "cures" were one patient with a high "climbing" curve (prepyloric ulcer) and two other patients with high acid curves (one prepyloric ulcer and one lesser curve ulcer).

Results of Gastrectomy.

Of the 37 cases in which gastrectomy was performed, in 26 of them a post-colic anastomosis to the jejunum was performed, in 10 the anastomosis was ante-colic, while in one case a "Billroth Number 2" operation was performed. Eleven patients died following operation (mortality 30%). There were five deaths among 11 patients, aged over sixty years, for whom partial gastrectomy was performed (45%).

Of the 26 patients surviving operation two died from unrelated causes within three years (one from coronary thrombosis, one from motor accident). Only 12 of the remaining 24 patients could be traced, of whom seven were cured and five improved. The average follow-up in these 12 cases is six years and the condition of all the "improved" patients was very markedly improved.

These 12 patients had suffered from lesser curve ulcer in six cases and prepyloric ulcer in four cases, while in the remaining two cases there were both lesser curve and prepyloric ulcers. They comprised eight patients in whom a posterior anastomosis was done and four cases in which the anastomosis was made anterior to the colon.

The gastric acidity prior to operation was recorded for only six of these 12 patients. In four of the six cases it was normal or low. In two cases there was a high gastric acidity and in both of these there was a prepyloric ulcer.

The results among those patients surviving partial gastrectomy must be regarded as very satisfactory.

Secondary Gastrectomy.—In two additional patients partial gastrectomy was performed as a secondary operation, and in these cases the results were not good.

The first of these patients was originally treated for prepyloric ulcer by gastro-enterostomy. Three years later he suffered a hæmatemesis. He submitted to operation again, the gastro-enterostomy being undone and a partial gastrectomy performed. A year later he was still suffering from dyspepsia and X-ray examination showed an ulcer crater on the lesser curvature higher up.

The second patient was first treated by excision of lesser curve ulcer. A partial gastrectomy was performed six months later for persistence of symptoms, a recurrence of the lesser curve ulcer being discovered. Six years later she was still in a poor state of health.

Simple Excision of Ulcer.

Twelve of these patients whose ulcers were simply excised survived (out of 15 operations) and nine have been traced. Of these, two are cured, two improved and five not improved. The two patients cured both had prepyloric ulcers, while the remainder all had lesser curve ulcers.

Secondary Operations after Excision of Ulcer.—Four of the patients not improved by simple excision of ulcer were subjected to further operation. In three of these a posterior gastro-enterostomy was added with a further excision of (recurrent) ulcer in one instance. These three patients describe themselves as improved in health. In the fourth case the second operation performed was a partial gastrectomy, as described in the preceding section.

Other Primary Operations.

Eleven other primary operations remain to be considered.

In three cases a pyloric exclusion operation was performed for prepyloric ulcer. One of these patients is cured (thirteen years), one developed a jejunal ulcer, one is untraced. In one additional case a pyloric exclusion operation was performed for lesser curve ulcer, with resection of a distal portion of stomach including the ulcer. The patient's condition was improved.

In three cases a pyloroplasty was performed for prepyloric ulcer. One patient was cured, one improved and one not improved.

In two cases cautery and oversewing of prepyloric ulcer were performed. One patient was improved, one died of another illness a year later.

One patient was treated by simple infolding of prepyloric ulcer; he was not improved. One patient had a gastro-duodenostomy performed for prepyloric ulcer; she was not improved, and a lesser curve ulcer in the *pars media* was revealed by X-ray examination three years later.

Other Secondary Operations.

Five patients (not included in any group hitherto) had secondary operations performed at the Royal Melbourne Hospital when the primary operation had been performed elsewhere.

In four of these cases a previous excision of ulcer had been performed and the secondary operation consisted of the addition of a posterior gastro-enterostomy. Of these four patients, one was improved, one not improved, one is untraced and one is stated (Registrar of Deaths) to have died of carcinoma of the stomach twelve years later, though whether this was confirmed by autopsy is unknown.

A fifth patient had had a sleeve resection performed elsewhere for "lesser curve ulcer". A Devine's exclusion operation was performed (at the Royal Melbourne Hospital) two years later for persistent symptoms. The patient died eighteen months later of carcinoma of the stomach (Registrar of Deaths).

The moral of these cases seems to be to avoid performing second operations when the first has been done elsewhere.

GASTRIC ULCER ASSOCIATED WITH CHOLECYSTITIS.

One patient only in the ten-year series had gastric ulcer associated with cholecystitis. At operation the gall-bladder was removed (chronic cholecystitis), while a lesser curve ulcer was treated by cautery and oversewing. The patient died three years later of intestinal obstruction (Registrar of Deaths).

III. PYLORIC STENOSIS.

A number of patients in the previous series had some degree of pyloric obstruction, but the patients in the present group all had a frank pyloric stenosis for which operation was not a matter of choice but a more or less urgent necessity. There were 15 such patients in the ten-year period.

Clinical Features.

These 15 patients comprised nine males and six females, with an average age of fifty-five years. In all of them copious vomiting was a symptom, and in three cases visible peristalsis was noted. In 12 of the cases a barium meal examination was performed, the diagnosis of pyloric stenosis being confirmed and varying degrees of gastric atony and dilatation being shown; in three cases X-ray examination was not possible on account of vomiting. Two patients had had previous perforation of (duodenal) ulcer, one year and four years earlier respectively, while one patient had had an excision of prepyloric ulcer performed four years before. One patient had a strongly positive Wassermann reaction.

Operative Findings.

In all cases a stenosis was identified at operation; in seven it was stated to be duodenal, in two there was a large indurated prepyloric ulcer, while in

the remaining six cases the precise situation of the ulcer responsible for the stenosis was not clear.

Operations Performed.

The operation of posterior gastro-enterostomy was performed on 13 patients, with entero-enterostomy in addition in one instance. For one patient a pyloric exclusion with gastro-enterostomy was done, and the remaining patient was treated by pyloroplasty.

Results.

Three patients died in hospital after operation. These included the patient operated on by pyloroplasty and the patient with a positive Wassermann reaction. Two other patients died two months and fifteen months later respectively of carcinoma of the stomach (Registrar of Deaths), but no autopsy evidence is available. The surgeons at the time of operation did not regard the conditions as malignant.

Of the 10 surviving patients five have been traced; of these, two regard themselves as cured and three as improved, though still suffering mild dyspepsia. The cured patients include an old lady for whom operation was performed at the age of seventy-two years; ten years later she says she is "as well as could be expected". The remaining five patients are untraced, including the patient for whom pyloric exclusion was performed.

IV. HOUR-GLASS STOMACH.

There were seven patients operated on in the ten-year period for hour-glass stomach.

Clinical Features.

These seven patients were all females, and the average age was fifty-nine years. Vomiting was a prominent symptom in all cases. In one instance an excision of a gastric ulcer had been performed nine years before. In all cases X-ray examination revealed the hour-glass appearance, with marked delay in emptying.

Operations Performed.

The operations performed were "sleeve resection" (four) and partial gastrectomy (two), while in one instance a wedge excision and gastro-gastrostomy were performed with a gastro-enterostomy in addition.

Results.

All patients survived operation. Of the four cases in which "sleeve resection" was performed the end-results were traced in two only. One patient is improved. In the second case a partial gastrectomy was performed five months later because of narrowing at the site of resection (X-ray finding). This patient is now cured (five years follow-up.)

The two patients for whom partial gastrectomy was performed, died respectively of carcinoma of the breast (ten years later) and intestinal obstruction (five years later) and their state of health after operation is unknown.

The patient for whom gastro-gastrostomy and gastro-enterostomy were performed, is improved (six years follow-up).

V. PERFORATED PEPTIC ULCER (TREATED BY GASTRO-ENTEROSTOMY).

Gastro-enterostomy was performed in nine cases during the ten-year period at the time of oversewing of a perforation of peptic ulcer. As these

cannot be classed as operations of election, they are considered separately. All these operations were done prior to 1930, and in fact gastro-enterostomy has not been done for perforated ulcer at the Royal Melbourne Hospital since then.

Clinical Features.

The patients were all males, aged between twenty-three and fifty-seven years. In five of them there was a perforation of a duodenal ulcer, and in four a perforation of a prepyloric ulcer. In all cases, after the perforation had been oversewn, a posterior gastro-enterostomy was performed. In one patient, in whom a perforation of a duodenal ulcer had sealed spontaneously, a condition of chronic cholecystitis was also found and a cholecystectomy was performed in addition.

Results.

All nine patients survived operation and the end-results (after twelve years) are as follows: two patients cured, three improved and one not improved; one patient died a year later from "cardiac failure, gastric ulcer" (Registrar of Deaths) and one patient died five years later from intestinal obstruction from adhesions; one patient is untraced.

Operations for Suspected Perforation.

Four additional cases may now be considered in which operation was performed because perforation was suspected, but no actual perforation was present. These also cannot be classed as operations of election. In two of them an excision of the ulcer was performed (one duodenal, one lesser curve gastric). Both these patients died of peritonitis and at autopsy a second ulcer (not perforated) was found in each instance—in the first on the lesser curve and in the second in the duodenum.

Of the other two patients, one was found to have a duodenal ulcer adherent to the liver but not perforated. It was separated and oversewn, and the patient's condition three years later was "improved". In the remaining case excision of a prepyloric ulcer was performed. Two years later a posterior gastro-enterostomy was added and the patient regards himself as cured (five years later again).

VI. SUMMARY OF RESULTS OF GASTRO-ENTEROSTOMY FOR ALL CONDITIONS.

At this point it may be of interest to consider the results of posterior gastro-enterostomy for all conditions. It will be found that the end-results of 116 patients who survived gastro-enterostomy have been effectively traced. This includes gastro-enterostomy with all various additional procedures, but

TABLE VII.

Results of Gastro-enterostomy in 116 Cases Fully Traced.

Condition for which Gastro-enterostomy was Performed.	Cured.	Improved.	Not Improved.	Jejunal Ulcer.	Total.
Duodenal ulcer (all cases)	26	21	13	9	69
Gastric ulcer (all cases)	14	20	6	2	42
Pyloric stenosis	2	3	—	—	5
Total	42	44	19	11	116

not the pyloric exclusion operation; and the conditions for which it was performed include duodenal ulcer, duodenal ulcer with cholecystitis, gastric ulcer, perforated ulcer and pyloric stenosis.

The results are shown in Table VII. Of all patients, 36% were cured and 38% "improved"—a total of 74%. The number developing jejunal ulcer represents 9·5% of the total of gastro-enterostomies—a figure approximately the same as that found in the large series reported by Garnett Wright.[23] These 116 cases do not include five cases mentioned earlier in which the patients died of carcinoma of the stomach subsequent to a gastro-enterostomy (performed for gastric ulcer in three cases and for pyloric stenosis in two).

VII. JEJUNAL ULCER.

Twenty-one patients with jejunal ulcer were treated in hospital during the ten-year period, or the ulcer occurred subsequently in patients whose operations have been considered in the preceding sections.

Of the 21 cases 12 have already been mentioned, the primary operation being performed at the Royal Melbourne Hospital during the ten-year period under review. In nine cases operation was performed for duodenal ulcer and in three for prepyloric ulcer. The nine additional cases have not been mentioned previously. The patients in three of these cases were operated on at the Royal Melbourne Hospital between 1914 and 1926, while in the remaining six cases the primary operation had been performed in other hospitals in Melbourne or in other parts of the world, including one from Liverpool and one in which gastro-enterostomy was done in Buenos Aires.

Clinical Features and Pathology.

The 21 patients comprised 19 males and two females. The average age was forty-eight years, the youngest being twenty-seven and the oldest seventy-nine years. In 12 cases the original lesion was a duodenal ulcer, in five a prepyloric ulcer; in one case gastro-enterostomy was performed originally for perforated ulcer, while in three cases the nature of the original lesion is unknown. Posterior gastro-enterostomy had been performed in 20 cases and a pyloric exclusion operation in one. In addition, infolding of the original ulcer had been performed in two cases, excision of ulcer in one case, entero-enterostomy in one case and oversewing of perforation in one case. Appendicectomy had been performed at the time of gastro-enterostomy in four cases.

The symptoms complained of were pain in all cases, hæmorrhage (either hæmatemesis or melena or both) in ten cases, vomiting in 14 cases (including fæcal vomiting in three). A perforation of jejunal ulcer occurred in one case.

The interval between the original operation and the diagnosis of jejunal ulcer varied from six months to seventeen years. In four cases it was over ten years, but in all these symptoms dated back many years previously, though the patients had not come under observation and the condition therefore was not diagnosed; in two cases diagnosis was not made until autopsy.

The situation of the jejunal ulcer was described as marginal in three cases, in the efferent loop in six cases (in four of them adherent to the colon). Two jejunal ulcers were present in one case and a gastro-jejuno-colic fistula occurred in three cases. In eight cases the situation of the jejunal ulcer was not precisely described or known.

Operations Performed.

In 14 cases operation was undertaken for relief of the condition, and these will now be described.

Restoration of Normal Anatomy.

In nine cases a restoration of normal anatomy was performed. In one of them a gastro-duodenostomy was also performed on account of scarring and stenosis in the pyloric region. This patient's original operation was posterior gastro-enterostomy with entero-enterostomy. In another case cholecystectomy was also performed for chronic cholecystitis which was found to be present. Of these nine patients, three died after operation and six survived.

Of the six survivors one patient (the one for whom gastro-duodenostomy was performed) was apparently cured. Five years after operation he was in excellent health, back at work, not dieting, and he weighed fourteen stone.

The condition of two other patients was improved (since restoration of normal anatomy), though they were still suffering from mild dyspepsia. One of them is the patient for whom cholecystectomy was also performed.

Three patients were not improved (since restoration of normal anatomy). One of them had severe dyspepsia and was losing weight. One had had recurring hæmorrhages starting six months after operation, and X-ray examination had revealed duodenal ulcer. The third was subjected to partial gastrectomy six months after the restoration of normal anatomy.

Partial Gastrectomy.

Partial gastrectomy was performed four times for jejunal ulcer (including the case just mentioned above). Of the four patients one died following operation. One was improved, but still suffering from mild dyspepsia. One regards himself as cured; he is back at work, not dieting and has gained nearly a stone weight. The fourth patient (for whom partial gastrectomy was performed six months after restoration of normal anatomy) was found at that time to have a prepyloric and two duodenal ulcers. He replied to the *questionnaire* that he was worse two years after his (third) operation. As he was then in gaol he may well have been a little embittered.

Other Operations.

Two other patients treated by operation remain to be considered. One patient was treated for jejunal ulcer by separation of the gastro-enterostomy, followed by a pyloric exclusion operation with a new posterior gastro-jejunal anastomosis. He died eighteen months later with gastro-jejuno-colic fistula.

The last patient treated by operation was one for whom a pyloric exclusion with anterior gastro-jejunal anastomosis was originally performed for a large posterior prepyloric ulcer, adherent to the pancreas and the colon, which was separated at the time. Seven months later he developed a gastro-jejuno-colic fistula with diarrhœa and fæcal vomiting. Operation was undertaken, the colon was separated and the fistula closed. The opening in the jejunum (that is, the ulcer) was oversewn and a jejunostomy was performed. The patient left hospital with the jejunostomy functioning, but died two years later with recurrence of gastro-jejuno-colic and cutaneous fistula.

Thus of 14 patients who submitted to operation for jejunal ulcer, four died after operation and two others died within two years from gastro-jejuno-colic fistula. Eight survived operation, of whom two are cured, three improved and three not improved. One of these last mentioned had submitted to a third operation.

Patients Not Treated by Operation.

Seven patients with jejunal ulcer were not treated by operation. Of these, three have died and four were still surviving in 1940.

One died of gastro-jejuno-colic fistula and one of hæmatemesis, autopsy revealing a healed gastric and an active jejunal ulcer. A third patient, a man

of seventy-nine years, died on the day of admission to hospital. Autopsy revealed a perforation of a jejunal ulcer into the lesser sac. Gastro-enterostomy had been performed seven years before for duodenal ulcer.

In the four remaining cases the diagnosis has been made on clinical and radiological evidence. Three of the patients have had hæmorrhages, but no operation has been undertaken. On a strict medical regime (including three months in bed for one patient), three of them are tolerably comfortable, while the fourth is in a very poor state of health.

There is no case of jejunal ulcer following a partial gastrectomy in this series, though it is well known that this can occur.[23]

Summary.

Of 21 patients with jejunal ulcer coming under observation in the ten-year period nine have died, three of them with the abominable complication of fæcal vomiting. Half the survivors are still suffering more or less severely, and it is apparent that the dread with which jejunal ulcer is regarded is not ill founded.

Operations for Suspected Jejunal Ulcer.

Mention may be made here of three other cases occurring in the ten-year period in which gastro-enterostomy was undone. The original operation was done elsewhere between 1914 and 1930 for prepyloric ulcer in two cases and for an unknown lesion in the third. In two of them jejunal ulcer was suspected and in the third the stoma was not functioning satisfactorily. Reconstitution of the normal anatomy was performed in each instance, though no jejunal ulceration was discovered at operation. One patient died three days after operation from coronary thrombosis. The results in the other two cases have not been traced.

VIII. RECURRENT PEPTIC ULCER.

Twelve cases of recurrent ulcer are known to have occurred apart from the jejunal ulcers already considered.

Of six patients who survived the operation of restoration of normal anatomy for jejunal ulcer, two are definitely known to have developed new peptic ulcers, as indicated in the preceding section. The first developed a duodenal ulcer six months later, while the second developed a prepyloric and two duodenal ulcers, also within six months.

In ten other cases the development of a recurrent or a new peptic ulcer (after the elimination of the first by operation) is definitely established. These have been mentioned in successive sections of this review and may now be collected as under.

In four cases there was a recurrence of a duodenal ulcer after its elimination by gastro-duodenostomy or pyloroplasty, the recurrence being identified at a second operation, performed in each case within four years.

In two cases there was a recurrence of lesser curve ulcer after its elimination by excision, a second operation being performed in each case within one year.

In two cases the occurrence of lesser curve ulcer after the elimination or healing of a duodenal ulcer is established. In the first the duodenal ulcer was excised (for hæmatemesis), but X-ray examination revealed the crater of a lesser curve ulcer one year later. In the second a duodenal ulcer had healed after gastro-enterostomy and infolding, but a lesser curve ulcer developed and was excised at operation after three years.

In two cases the occurrence of a lesser curve ulcer was revealed by X-ray examination after the elimination of a prepyloric ulcer, by partial gastrectomy in one case and by gastro-duodenostomy in the other, in each case the new ulcer developing within three years.

There are twelve other cases in which a recurrence of peptic ulcer can be presumed from the later symptoms (hæmatemesis *et cetera*), but the presence and situation of the recurrent ulcer have not been definitely proved. Nor does this include cases in which a second operation revealed merely failure of healing of the original ulcer (for example, after gastro-enterostomy). After reviewing the case histories it becomes apparent that most of those patients falling in the "not improved" group in the tables given are suffering from a persistence or a recurrence of peptic ulcer.

IX. HÆMATEMESIS: TREATMENT BY OPERATION.

Eighteen patients were operated on for hæmatemesis during the ten-year period.

Clinical Features and Pathology.

These patients comprised 15 males and three females and the average age was forty-seven years. Most of these patients had a history of dyspepsia for over five years. A history of dyspepsia for longer than one year was given by all patients except two, who proved to have acute ulceration. In one case there was a history of previous perforation of the ulcer, and in another an excision of duodenal ulcer had previously been performed. In all cases operation was performed because of severe and continuing hæmatemesis. The source of the bleeding in these cases is shown in Table VIII.

TABLE VIII.

Source of Bleeding in Cases of Hæmatemesis Treated by Operation.

Source.	Number of Cases.
Acute duodenal erosion	1
Acute lesser curve ulcer	1
Chronic duodenal ulcer	7
Chronic prepyloric ulcer	2
Chronic lesser curve or posterior wall gastric ulcer	7
Total	18

Operations Performed.

The operations performed are shown in Table IX. A direct hæmostasis by excision or other local treatment of the ulcer was attempted in ten cases, and a partial gastrectomy was performed in four.

TABLE IX.

Operations Performed for Hæmatemesis.

Operation.	Number of Cases.
Partial gastrectomy	4
Excision of lesser curve gastric ulcer	3
Transgastric excision of posterior wall ulcer	1
Excision of duodenal ulcer	2
Infolding of duodenal ulcer	3
Duodenostomy and hæmostasis	1
Gastro-enterostomy	1
Jejunostomy	1
Laparotomy	2
Total	18

Results.

Fourteen of these patients died following operation and four survived—a mortality rate of 78%.

It is noteworthy that the source of bleeding of six of the patients who died, was not accurately identified. Thus in two cases the bleeding ulcer was not discovered at laparotomy and the abdomen was closed without further procedure. At autopsy in one of these an acute duodenal erosion was found and in the other a high posterior wall ulcer one inch from the cardia.

In one case a wedge incision of the incisura was performed, but at autopsy a lesser curve ulcer was found intact near the cardia.

In one case a partial gastrectomy was performed, but at autopsy the lesser curve ulcer responsible for the bleeding was still intact above the anastomosis.

In the treatment of two patients an infolding of the anterior duodenal wall was performed, but at autopsy in one case a posterior wall duodenal ulcer with an open-mouthed vessel was found, and in the other a prepyloric ulcer on the lesser curve.

The difficulty of identifying the site of a peptic ulcer with certainty by external inspection of the stomach and duodenum has been emphasized by Wright-Smith.[2]

A brief account may be given of the four patients who recovered. In one instance a gastrectomy was performed for duodenal ulcer, the distal section cutting across the ulcer (anterior wall). This patient three years later had gained two stone in weight and was back at work, free from symptoms.

In one case an infolding of anterior wall duodenal ulcer was performed. The patient is back at work, but still under treatment (diet and powders).

In one case an excision of anterior wall duodenal ulcer was performed. A year later X-ray examination revealed a lesser curve gastric ulcer and the patient is still under treatment.

The fourth patient who recovered had an excision of a lesser curve gastric ulcer performed. He has not been traced since leaving hospital.

Conclusion.

From the above account it is obvious that the results of operation for hæmatemesis are not good. It may be mentioned that during the same ten-year period approximately 350 patients were admitted to the hospital suffering from hæmorrhage from a peptic ulcer and that 62 of them died, that is, 18%.[1]

It is not suggested that any reasonable comparison can be made between the mortality of patients operated on and of those not treated by operation. All patients for whom operation was performed were gravely endangered by the hæmorrhage. There may be some cases in which gastric or duodenal hæmorrhage can be arrested only by direct hæmostasis. Nevertheless, it would seem from the above series that operation for hæmatemesis should be avoided if at all possible.

X. PERFORATED PEPTIC ULCER.

The cases of perforated peptic ulcer are presented as supplement to the main inquiry, to give some perspective in regard to the frequency and fatality of this catastrophe in relation to the number of cases in the previous categories. An even better perspective could be obtained if it were possible

[1] It should also be stated that treatment by massive blood transfusion was not commonly practised during this period (that is, prior to June, 1937).

to enumerate all patients with peptic ulcer attending for treatment during the period under review, whether suffering from complications or submitting to operation or not. But this has not been feasible. To obtain figures of any value it would be necessary to formulate some kind of registry of peptic ulcer with rigid criteria regarding an acceptable diagnosis. So far, this method has been applied only to the rare diseases.

Cases of perforated peptic ulcer have been collected over a period of five years only (June 30, 1932, to June 30, 1937), representing the second half of the ten-year period studied in the other classes of case. This period gives a sufficient number of cases for the purpose, and a comparison with an earlier series (1920 to 1929), collected by Mervyn Stewart[6] from the same source, will show that the position has not appreciably changed since then and the general conclusions are the same.

It may be noted, however, that the average number of patients *per annum* admitted to the hospital in the ten years 1920 to 1929 (inclusive) was 26, while over the five-year period June 30, 1932, to June 30, 1937, the average number of admissions *per annum* was 43. This represents an increase of 65%, which seems greater than the increase in population or other such factors can satisfactorily explain. It would also appear that the proportion of perforations occurring in women is diminishing.

Follow-up of these patients has not been attempted, and the results are set out as briefly as possible.

Patients Admitted.

Two hundred and thirteen patients suffering from perforated peptic ulcer were admitted to the Royal Melbourne Hospital over the five-year period. They comprise 202 males (95%) and 11 females (5%), the average age being forty-six years. The youngest patient in the series was aged twenty-one years and the oldest seventy-nine.

Sixteen patients died without operation, or rather without effective operation, for a drainage of secondary abscess (subphrenic *et cetera*) was performed in six cases, but an oversewing of the ulcer was not done. These patients were admitted moribund (nine cases) or the cause of their illness was not diagnosed while they were alive. They include five patients aged over seventy years.

Patients Operated on by Oversewing of Ulcer.

One hundred and ninety-seven patients were treated by effective operation, that is, an oversewing of the perforation was performed. No other measures were undertaken in any of these cases except for drainage of the peritoneal cavity, which was done in 151 cases.

Mortality.—Of these 197 patients, 48 died and 149 survived, giving a mortality among patients operated on of 25%. If those patients not operated on by oversewing are included, the mortality figure becomes 30% of all cases. Four patients aged over seventy years survived operation, the oldest patient surviving being aged seventy-eight years.

Site of Ulcer.

The perforation was of a duodenal ulcer in 107 cases and of a gastric ulcer in 105. Of the gastric ulcers 46 were described as prepyloric, 24 as lesser curve ulcers, while in 35 cases the ulcer was not specified other than as "gastric". In one case there was a perforation of a jejunal ulcer into the lesser sac. These figures as to the site of ulcer cannot be regarded as accurate, for in many instances its situation was not clearly described. In

several cases in which the patients died the ulcer which had been oversewn was found at autopsy in a situation different from that described after operation.

Mortality in Relation to Age Groups.

The mortality in relation to age groups is set out in Table X. which includes only those patients for whom an oversewing of the ulcer was performed. It will be seen that the mortality among patients under fifty years is less than half that of patients over fifty years.

TABLE X.

Mortality from Perforated Peptic Ulcer in Relation to Age Groups.

Age Group.	Number of Patients Operated on.	Number of Deaths.	Mortality Percentage.
Over 50 years	79	29	37
Under 50 years	118	19	16
Total	197	48	25

Mortality in Relation to Duration of Perforation Prior to Operation.

The mortality in relation to duration of perforation prior to operation is shown in Table XI, from which it can be seen that the mortality among patients operated on within six hours of perforation is one-third of that in the group whose operation was performed between six and twelve hours afterwards; while it is about one-sixth of the mortality among patients operated on later than twelve hours after perforation.

TABLE XI.

Mortality from Perforated Peptic Ulcer in Relation to Duration of Perforation.

Interval after Perforation.	Number of Patients Operated on.	Number of Deaths.	Mortality Percentage.
Under 6 hours	111	12	11
6 to 12 hours	61	20	33
Over 12 hours	25	16	64
Total	197	48	25

There were 73 patients aged less than fifty years and operated on within six hours of perforation. Of these, only three died—a 4% mortality.

The influence of these two factors of age and the time interval prior to operation is plainly evident from these figures, and it is obvious that the earliest possible diagnosis and operation are the paramount considerations.

Complications among Patients Surviving Operation.

The following major surgical complications occurred among patients surviving and were successfully treated:

Subphrenic abscess	4
Intestinal obstruction	3
Burst abdomen	1
Incisional hernia	2

Causes of Death.

Death was due to peritonitis in nearly all cases, but the following main causes of death are also recorded: bronchopneumonia (3), pulmonary abscess (1), pulmonary tuberculosis (1), empyema (3), subphrenic abscess (8), pylephlebitis or liver abscess (4), pelvic abscess (1), cerebral and renal abscesses (pyæmic) (1), hæmorrhage from the ulcer (3), intestinal obstruction (1).

Some of these conditions occurred in conjunction in the same patient. Two patients also had cholelithiasis. One patient developed a fistula ten days after operation. Laparotomy was performed and a gastro-enterostomy was done for this, but the patient died soon after operation.

Sixteen patients died without oversewing of the ulcer having been done. In three cases a subphrenic abscess was drained, in one perigastric abscess and in one an empyema was drained. In one case laparotomy revealed a plastic peritonitis, but the perforation could not be discovereed. The remainder of these patients died of peritonitis without operation, one of them suffering from hæmatemesis also.

GENERAL CONCLUSIONS.

After a consideration of this series of cases and a perusal of a fair proportion of the immense literature on the subject, I make bold to state:

1. That the true and essential cause of peptic ulceration is quite unknown; that the ulceration *per se* (whether of stomach or duodenum) is a manifestation of a diathesis, or the effect of an inherent or constitutional disability whether endocrine or neurogenic, or of whatever nature it may be.

That this factor, which is the governing influence, varies in the severity of its effects with resultant remissions and relapses in its gastric manifestations; that remission may be permanent, that is, a natural cure can occur; or that the factor, whatever it is, may "burn itself out", just as the effects of untreated primary Graves's disease (thyreotoxicosis) may cease when the toxic influence "burns itself out", though the host may be wrecked or destroyed in the process in either of these conditions.

That the degree of gastric acidity may be an index of the varying severity of the causative influence and is therefore important in prognosis, but that it is not a prime cause in itself.

2. That medical treatment by means of dieting and the use of alkaline powders *et cetera* is no more to be regarded as a cure for peptic ulcer than the regime of dieting and insulin constitutes a cure for *diabetes mellitus*.

In the only statistical review which I have been able to discover[5] of the end-results of medical treatment, the proportion of patients cured and the results generally (after a five- to fifteen-year period) were substantially the same as of those treated surgically, as in the present series.

3. That surgical treatment can be of benefit in only two ways, both of which are mechanical, namely:

(*a*) Extirpation of the vulnerable parts in which the disease is manifested (though not the true seat and cause of it), for example, by partial gastrectomy. Although often effective, this should not be regarded as a cure in the true sense any more than the amputation of a gangrenous leg can be said to have cured a patient of Buerger's disease which has resulted in the gangrene. If the antecedent process is still operating with sufficient intensity, the patient after partial gastrectomy can still develop another peptic ulcer (gastric or jejunal), just as the sufferer from Buerger's disease can develop a new zone of gangrene in the distal part of his amputation stump.

(*b*) Relief of obstruction, for example, stenosis, as by gastro-enterostomy. This may be compared with the relief of an obstruction from a tuberculous mass in the caecum by the performance of ileo-colostomy. In both cases the symptoms are mechanically relieved, but this has no direct bearing on the cure of the primary condition. Relief of obstruction may also be taken to include the mechanical obstruction to the movement of the stomach, as, for example, from the adhesion of an ulcer to the pancreas, which comes to form the base of the ulcer.

Plainly this is also a mechanical obstruction to healing, even should a permanent remission occur, and only by surgical means can this obstruction be overcome.

4. That when a permanent and apparently true cure follows either medical or surgical treatment, it is because this has coincided with a natural remission of the essential causative factor, or because the process has "burnt itself out" (as may be the case in pyloric stenosis, gastro-enterostomy merely completing the cure by the relief of the residual mechanical obstruction).

Briefly, then, a conception is submitted of peptic ulcer as a disease which essentially runs a natural course, which may be life-long. This is not by any means to suggest that treatment is valueless, but rather that its scope must be considered in relation to the natural history of the disease. In this regard it is obvious that medical and surgical treatment each has important and to some extent complementary roles. But if the general limitations of all forms of treatment are understood according to this hypothesis, it may be possible to form a truer picture of the likely prognosis, avoiding thereby the disillusionments which have hitherto been so common.

SUMMARY.

1. A review is given of all operations performed for peptic ulcer at the Royal Melbourne Hospital over the ten-year period 1927 to 1937. These include operations of election for duodenal and for gastric ulcer, operations for pyloric stenosis and hour-glass stomach, and operations for hæmatemesis and for jejunal ulcer. An attempt has been made to trace the end-results in all patients surviving.

2. Operations for perforation of a peptic ulcer have been reviewed over a period of five years only (1932 to 1937), and only the immediate results have been considered in regard to these cases.

3. Operations of election were performed on 115 patients for chronic duodenal ulcer, posterior gastro-enterostomy being performed in 97 cases. The operative mortality of gastro-enterostomy in these cases was 4%. The end-results among patients traced reveal that 65% of the survivors were benefited by operation, while 15% developed jejunal ulcer.

The prognosis after operation is shown to be better for patients with some degree of duodenal stenosis or with a low gastric acidity. The prognosis appears to be worse for patients having a high gastric acidity.

The results of other operations for duodenal ulcer are given, including ten additional cases in which chronic duodenal ulcer and cholecystitis were present.

4. Operations of election were performed on 126 patients for chronic gastric ulcer. Gastro-enterostomy was performed in 62 of them with an operative mortality of 8%. Of the survivors, carcinoma is known to have developed in three. The end-results among other patients traced reveal that 80% of patients were benefited by operation and that jejunal ulcer developed in 6%.

The results of gastro-enterostomy in cases of lesser curve ulcer appear to be better than in cases of prepyloric ulcer, especially when combined with excision of ulcer.

Partial gastrectomy was performed as the primary operation in 37 cases with an operative mortality of 30%. All surviving patients traced were benefited by operation.

Simple excision of lesser curve ulcer was performed in 12 cases with an operative mortality of 25%. Secondary operations performed on these and other patients with gastric ulcer are described.

5. Operations for pyloric stenosis were performed on 15 patients. The immediate and end-results in these cases are given.

6. Operations for hour-glass stomach were performed on seven patients. The operations performed and the end-results are described.

7. The end-results of gastro-enterostomy performed for any of the above classes of condition have been collected. One hundred and sixteen such patients have been effectively traced; 74% of these were benefited by operation, while a jejunal ulcer developed in 9·5%.

8. In regard to gastro-duodenostomy, pyloroplasty and pyloric exclusion, the number of these operations performed was few (only 28 for all classes of case). The results were indifferent.

9. Twenty-one cases of jejunal ulcer which came under observation during the ten-year period are reviewed. In 14 of these, operations were performed for the cure of the condition, and these are described with their results.

10. A brief description is given of 12 additional cases in which recurrence of a peptic ulcer (in the same or in a new situation) is known to have occurred, and of a number of others in which a recurrence can be reasonably presumed.

11. Operations for the control of hæmatemesis were performed on 18 patients. Only four of these patients survived. The details of these cases are given.

12. Two hundred and thirteen patients with perforated peptic ulcer were admitted to the hospital during the five-year period 1932 to 1937. Oversewing of the ulcer was performed in 197 of these cases with an operative mortality of 25%. The mortality among all patients admitted was 30%. The results in relation to the age of the patient and the duration of the perforation are given.

13. It is submitted that peptic ulceration is a constitutional disease essentially running a natural course irrespective of treatment.

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MALIGNANT EXOPHTHALMOS OR EXOPHTHALMIC OPHTHALMOPLEGIA.[1]

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In the ordinary course of events, the exophthalmos of Graves's disease recedes *pari passu* with the relief of the thyreotoxic symptoms, but in the nine cases which I am presenting, the exophthalmos increased in spite of the relief of the toxic symptoms and, somewhat to the discomfiture of the surgeon, has been called post-operative exophthalmos. There is some truth in this, for in three of the cases there was no exophthalmos before operation, yet exophthalmos did develop a month or more after an operation for relief of thyreotoxicosis.

A number of cases have been described in which exophthalmos occurred independently of operation; so it is now regarded as due to a separate and unknown thyreotropic agent, which may or may not be associated with the known thyreoid-stimulating hormone (T.S.H.). I say associated because so far as I know all the cases of malignant exophthalmos have been coexistent with some enlargement of the thyreoid gland. The suggestion that some different factor is at work in the production of malignant exophthalmos as against the exophthalmos of ordinary Graves's disease, receives strong presumptive evidence when we compare the age and sex grouping in the two conditions.

Exophthalmic goitre is a disease of early adult life and is much commoner in females, while in the type of conditions we are now considering, exophthalmos occurs in patients of forty years of age or over and the sex incidence is almost reversed. Of the nine patients six were men and three women.

As far as I know, the first case was reported by Crotti in 1920; it followed X-ray treatment of a woman with thyreotoxicosis; eventually both globes were removed.

Signs and Symptoms.

The signs and symptoms are as follows:

1. Protrusion of the globe occurs; frequently the protrusion is different in degree in each eye.

2. Pain is complained of in the eyeball (how infrequently does the young exophthalmic goitre patient talk of any eye pain) and it is noticed that the pain varies with the amount of conjunctival reddening and œdema, a condition that changes from day to day.

3. Œdema of eyelids occurs, especially the upper lid. I believe this to be one of the earliest signs, so much so that in future I do not think I would operate on an exophthalmic patient over forty years of age who showed this sign.

4. A gentle attempt to push the globe back into the socket gives a feeling of resistance not present in ordinary Graves's disease.

5. As the case proceeds, the movements of the eyeball become restricted. Often the *levator palpebræ* escapes, and always the intraocular muscles; this

[1] Accepted for publication on November 9, 1944.

is one of the signs by which the condition can be distinguished from the ophthalmoplegia of *myasthenia gravis*.

6. In all the severe cases papillœdema develops as the protrusion becomes worse.

7. Ulceration of the cornea with hypopyon is the final picture and cannot be prevented in spite of all efforts designed to protect the cornea—from the use of eyeshields to suture of the lids.

8. Areas of œdema and pigmentation occur on various parts of the body, perhaps more commonly on the front of the legs.

THE COURSE OF THE DISEASE.

In many cases the disease gradually dies out; but it often leaves the patient with an unsightly deformity and sometimes double vision. Only occasionally has a complete regression of the exophthalmos occurred.

In other cases the condition progresses until the disorganization of the eyeball is so great that excision of the globe has to be performed. Two patients have lost both eyes and two others have lost one eye each. In all cases the œdema of the lids persisted long after the excision, so that artificial eyes could not be fitted until the disease had worn itself out.

THE CAUSE OF THE DISEASE.

Many suggestions have been made as to the cause of exophthalmos—for example, swelling of the extraocular muscles or overaction of the sympathetic; but it is now generally accepted that there is an œdema of all the orbital tissues outside the globe and this increase in size of the orbital contents pushes the eyeball forward. It also restricts the free movements of the eyeball by its very solidarity, leading Brain[1] to call the condition exophthalmic ophthalmoplegia. He dislikes the term malignant exophthalmos because of its suggestion of cancer.

It seems certain that the hormone responsible for the orbital œdema is different from the one which produces the other well-known signs of thyreotoxicosis. We know that the pituitary gland is responsible for the thyreoid-stimulating hormone, so it is reasonable to suppose that this other also comes from the pituitary gland. Œdema is a sign of water imbalance; we know that the water balance of the body is influenced by the pituitary gland—a clinical example is *diabetes insipidus*, the main symptom of which is polyuria and this can be kept under control by injections of posterior pituitary extract.

Why this hypothetical pituitary hormone should produce an œdema only in one or both orbits (with occasional patches of œdema over the tibiæ) is difficult to understand, but there are other conditions in which œdema is limited to certain parts of the body—for example, in myxœdema the supraclavicular fossæ, face, hands and larynx are the parts most commonly affected.

THE TREATMENT.

Following on what has been said, it would seem that deep X-ray therapy applied to the pituitary gland might be useful; it is still advocated.

In the first two cases this was used without any appreciable effect. Indeed, it may even have made the condition worse; three eyes were lost in these two cases.

Naffziger[2] proposed and performed an operation for the decompression of the orbit by removing the entire roof. I have performed this operation four times, and although at the finish of the operation the eyeball seemed almost lost in the socket, in a few hours it gradually came forward and was as prominent as ever.

Naffziger described an increase in size of the ocular muscles (five times the normal). In the cases here recorded in which the orbital contents were exposed by removal of the roof, the muscles were not unduly large and the only change found in a biopsy specimen was very slight round celled infiltration and œdema.

Another suggested treatment for this terrible disease is removal of the stellate ganglion. No improvement occurred in the one case in which it was done here. I now believe it is best to treat the condition by encouraging water excretion from the body and hoping for remission or dying out of the disease before the eyeball is destroyed.

In Graves's disease or people with a high basal metabolic rate, the skin is moist, perspiration is excessive, so that there can be little water retention. In myxœdema or people with a low basal metabolic rate, the skin is dry and perspiration is minimal; there is water retention.

In three of the cases the condition started with severe thyreotoxic symptoms and no exophthalmos; the basal metabolic rates were round about +40% or +50%. After operation the toxic symptoms were entirely relieved and the basal metabolic rate was 0 or slightly *minus*. From periods varying from two weeks to as much as twelve months after the operation the eyes began to become painful and the eyelids œdematous, followed soon by exophthalmos and some ophthalmoplegia. The patients were immediately given thyreoid extract until the basal metabolic rate was again raised, this time to +28% or +30%. This increased the loss of body fluids, and although many months went by the patients are now well and do not need to keep their basal metabolic rates raised because the eyes have receded—the flame of the disease has died out.

In addition to thyreoid extract the patients received injections of mercurial diuretics on the days on which the eyeballs seemed particularly œdematous and painful. In one case the patient firmly believes that leeches applied to the outer side of the orbit were the cause of relief.

The first four patients in the series were treated by decompression of the orbit; one had excision of stellate ganglion; two had deep X-ray therapy to the pituitary gland; to these were added suture of eyelids or other measures designed to protect the cornea. Two of the patients lost both eyes and two lost one eye each with considerable diminution of vision in the remaining eye from the optic atrophy.

SUMMARY OF CASE HISTORIES.

Here follows a summary of the last five cases; no surgical measures were adopted; the treatment consisted in raising the basal metabolic rate so as to increase water excretion. In all of them the disease has been controlled.

K., aged thirty-six years, a gardener, had a traumatic blind left eye for twenty years. He had severe thyreotoxicosis. His basal metabolic rate was +49%. Exophthalmos was marked in both eyes. Small corneal ulcer of his good eye was present and healed before operation. In consultation with Dr. Cronin and Dr. Fairclough, it was decided to perform thyreoidectomy as the toxic symptoms were so severe. After operation the basal metabolic rate became normal, but the eyes became worse with definite ophthalmoplegia.

For twelve months two grains of thyreoid extract were given three times a day; this kept the basal metabolic rate up to +25% or thereabouts. During this time the patient went back to his work as a gardener, wearing dark glasses. For this last six months he has taken no thyreoid extract and has no trouble with his good eye, though it is still somewhat prominent.

McD., aged thirty years, a labourer, suffered from thyreotoxicosis, but had no exophthalmos. Exophthalmos was developing slowly after operation six months previously. One grain of thyreoid extract was given twice a day. As the pulse rate

was 100, the dose of thyreoid extract was kept small. The basal metabolic rate was now +3·9%, and the pulse rate 120. The exophthalmos is becoming less, but slight papillœdema is present. The patient's condition is definitely improving.

E., aged forty-six years, a soldier, had an operation for thyreotoxicosis eighteen months ago. The basal metabolic rate before operation was over +30%. Fifteen months after the operation he reported again, saying that for three months his symptoms of thyreotoxicosis were gradually recurring; but this time exophthalmos was present with œdema of the lids. The basal metabolic rate was +46%. The remnants of gland tissue left at the operation had increased in size so much that each side of the patient's neck was bigger than before the previous operation.

Owing to the œdema of the lids, only the right recurrence was removed. After this operation the patient developed tetany, which was kept under control with calcium and "AT10".

The right fundus showed mild papillœdema. The patient is being treated with two grains of thyreoid extract three times a day, and is improving so much that he is returning to work.

Mrs. W., aged forty-four years, suffered from thyreotoxicosis, but had no exophthalmos. In February, 1943, she was subjected to thyreoidectomy. She was seen again in February, 1944. Her eyelids were œdematous and her eyes prominent and painful. She was given two grains of thyreoid extract three times a day and her basal metabolic rate was raised to +36%. Two months later her eyes were much better.

G., aged forty-seven years, was a bank clerk. In December, 1943, he was thought possibly to be suffering from malignant exophthalmos with thyreotoxicosis. His basal metabolic rate was +53%. Operation was performed in December, 1943. In March, 1944, the basal metabolic rate was +7%. The eyes were more prominent and reddened, and œdema of the lids and pain were present. Treatment consisted in the administration of one grain of thyreoid extract twice a day. In August, 1944, the patient's condition was much improved.

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THE TREATMENT OF BATTLE CASUALTIES IN THE CENTRAL MEDITERRANEAN AREA.[1]

By EARDLEY BUTTON,
Lieutenant-Colonel, New Zealand Medical Corps.

AFTER over four and a half years spent in the Middle East, it seems at this stage of the war unnecessary to discuss the peculiar problems of desert warfare. It is of interest, however, to contrast these with the more recent experiences of Continental war as seen during nine months in Italy, from a New Zealand casualty clearing station.

In the Western Desert, because of the difficulties of a long line of evacuation, the principle was evolved of keeping the forward surgical centres as far forward as possible. Thus field surgical units were formed, which, for the most part, worked with the main dressing station of a field ambulance rather than with a casualty clearing station. This procedure was satisfactory in that it much reduced the "time lag" between the time when a wound was received and the time when surgical treatment was first available for the seriously wounded. The main disadvantages were the difficulties of giving adequate nursing facilities to patients at this level, and the difficulties of holding seriously wounded patients for a sufficient time in a mobile unit when the next centre, the casualty clearing station, might be as much as twenty-five to fifty miles behind over rough desert tracks.

In Italy the medical set-up approached very much more the textbook standards. This country on the whole is mountainous, with considerable wooded areas, and is much broken up by small streams and rivers. The "front line" was so a more definite entity than was the case in the desert, and considerations of cover were more favourable. Transport was confined, especially in the winter months, almost entirely to the roads. It was so possible for a casualty clearing station to be established much further forward than was the case in the desert, and generally a casualty clearing station group was sited about twelve miles behind the forward areas. The time of evacuation to the casualty clearing station so depended largely on the state of the weather, which materially affected the roads, and also on the amount of transport on the road, together with demolitions, necessitating halts and one-way traffic sections. Air superiority was a big factor in allowing the roads to carry their maximum transport. Thus it was not uncommon to find that patients reached a casualty clearing station some two hours after being wounded, though the average "time lag" during a battle was about six to eight hours.

In these circumstances the field surgical units were usually attached to the casualty clearing station to reinforce its surgical strength, and the casualty clearing station so became the ideal forward surgical centre, with four available operating theatres, good nursing facilities, by reason of Army Nursing Service personnel attached, and the accommodation to hold the seriously wounded for a sufficient time.

At the start of this campaign, the casualty clearing station group frequently functioned in requisitioned buildings, but as the campaign progressed the units became tented. It was felt that there were many advantages in a tented layout, which allowed of standardization, a quick set-up and a quick get-away, and also the space for a better crisis expansion.

[1] Read at the annual meeting of the New Zealand Section of the Royal Australasian College of Surgeons, August 31, 1944. Accepted for publication on January 18, 1945.

TREATMENT OF BATTLE CASUALTIES.

In Italy most of the urgent surgery, including the abdominal operations, was done at the casualty clearing station level. As patients were evacuated, the surgeon at the main dressing station selected and held for treatment only those casualties urgently ill because of hæmorrhage or patients suffering from such great damage to soft parts that they failed to respond to blood transfusion and the usual methods of resuscitation. This type of patient, after an initial blood transfusion and the surgical removal of damaged tissue at the main dressing station, tended to respond extremely well to the continued treatment of his "shock", and would be fit to evacuate in twenty-four hours to the casualty clearing station. This entailed a short trip of about thirty minutes in an ambulance on a tar-sealed road.

Blood was available to patients coming down from both the advanced dressing station and the main dressing station, and arrangements were such that a continuous drip transfusion was carried on in the ambulance during the transport of the patient, so saving much time in resuscitation at the casualty clearing station. On arrival at this unit the usual sorting and selection of cases was done.

Neurosurgical and maxillo-facial casualties were transferred to the mobile specialist units handling these types of patient in the casualty clearing station group. This arrangement produced the best results. Patients with abdominal wounds, chest wounds and the many and various wounds of the extremities were handled in the casualty clearing station theatres.

Abdominal Conditions.

The results in abdominal wounds were considered encouraging, and at one period during the battle for Cassino, eighty-four consecutive abdominal operations were done, with a mortality of 25% at this level. The factors which made for success were considered to be: (*a*) adequate resuscitation, (*b*) a standardized operative procedure, (*c*) good nursing, (*d*) the retention of the patient at the casualty clearing station for fourteen days before evacuation.

Patients with abdominal wounds reached the casualty clearing station on an average nine hours after being wounded, and averaged four hours in the pre-operation ward during resuscitation. The ideal aimed at was a systolic blood pressure rising to 100 millimetres of mercury before operation. Only when there were signs of internal hæmorrhage and no response to resuscitation occurred, were they operated on earlier. Patients so reached the operating table some thirteen hours after being wounded. At operation a routine examination of the bowel was made and the wounds of small bowel were oversewn, while those of the large bowel were exteriorized as a colostomy. The number of resections necessary for small bowel, even in the face of multiple lesions, was surprisingly small. Wounds of the solid viscera were dealt with so that hæmorrhage was arrested. In wounds of the left upper quadrant splenectomy, nephrectomy and the mobilization of the splenic flexure with a colostomy were at times necessary.

When gross contamination had occurred, ten grammes of sulphadiazine in suspension were inserted into the peritoneal cavity before closure.

The great majority of deaths occurring in this series took place in the first forty-eight hours after operation, among patients with multiple injuries involving other parts in addition to the abdominal cavity, and appeared to be the result of an irreversible shock of an irrecoverable injury.

Post-operatively all patients as a routine measure were treated by continuous gastric suction and intravenous drip therapy for an average of four days, and it was here that the high standard of nursing meant so much.

During the period that the gastric suction was functioning patients were allowed fluids by mouth as they wished. Most of this fluid siphoned back, but the general comfort was increased and oral toilet was easier. The gastric tube was not removed until a trial test by clamping at intervals showed there was no retention. Ileus was a rarity. The patients were held and nursed for fourteen days before evacuation to a general hospital.

Chest Conditions.

An excision of the wound of the chest wall and the trimming of shattered rib ends were carried out, and the muscle layers were oversewn to produce an airtight closure. The hæmothorax was removed by suction at the time of operation and by aspiration later as necessary, and 15,000 units of sodium penicillin were instilled into the pleural cavity following each aspiration. The metallic foreign body was not sought for and removed unless obviously accessible. Results were good, and later infection of the lung and pleural cavity was much reduced after penicillin therapy was instituted.

Wounds of the Soft Parts.

Wound excision was done by the standard technique, and penicillin-sulphathiazole powder was insufflated into the wound. A *tulle gras* or "Vaseline" gauze dressing was applied and the wound was not sutured at the casualty clearing station. The part was immobilized, and the patient was evacuated to a general hospital, where the aim was for the first dressing to be done in the theatre and a delayed primary suture to be carried out whenever possible.

Wounds of the popliteal fossa with injury to the popliteal artery were notorious for their poor results. Following ligation of the popliteal artery the majority of these patients came to amputation, often above the knee.

A lumbar sympathetic block or a lumbar sympathectomy did not appear to improve materially the functional results of ligation of this artery. Latterly the most promising results were obtained by a wide fasciotomy from the upper part of the popliteal fossa to the *tendo Achillis* done at the time of ligation to relieve all tension on the calf and its main posterior neuro-vascular bundle. Three pints of blood were then given post-operatively and the limb was nursed in the dependent position exposed to the atmosphere. Of three patients treated by this method two were able to retain a functional limb. A secondary suture of the wound of the calf was carried out in from seven to ten days following the ligation.

In Italy, penicillin was used locally in the wounds of soft parts as a routine measure, and it was felt to be a considerable factor in the control of wound infection.

The results of the treatment of battle casualties in this campaign are considered very favourable, and are due to a medical organization which allows of a shortened "time lag" before the first treatment, together with the increased facilities for treatment, in which the excellence of the blood transfusion units and the advances in chemotherapy, as a factor in the control of sepsis, play so large a part.

SUMMARY.

1. The problems of evacuation and the establishment of forward surgical centres in Italy are contrasted with those in the Western Desert.

2. Some principles in the treatment of the main types of battle casualties are discussed: (*a*) abdominal wounds, (*b*) chest wounds, (*c*) wounds of the extremities and injuries of the popliteal artery.

ACKNOWLEDGEMENT.

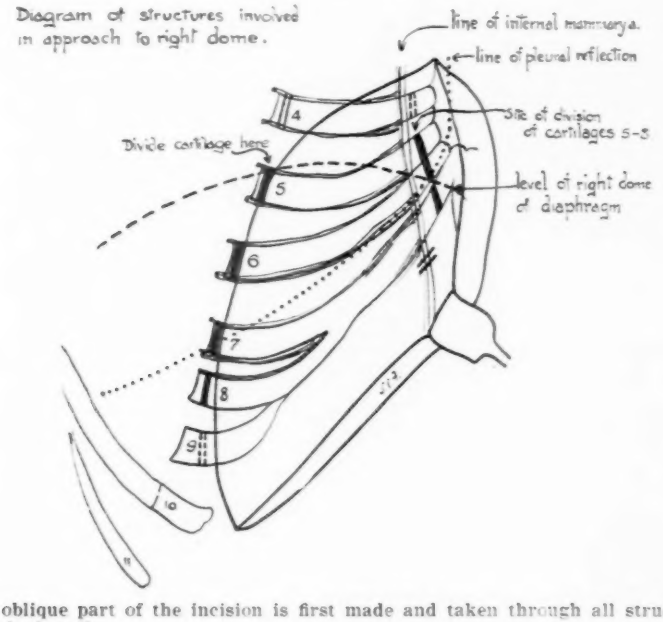
I wish to thank Major-General F. T. Bowerbank, Director-General of Medical Services, for permission to publish this paper.

Surgical Technique.

THE SURGICAL APPROACH TO HYDATID CYSTS OF THE RIGHT DOME OF THE LIVER.[1]

By S. C. FITZPATRICK,
Hamilton, Victoria.

Of the most general value in approaching hydatid cysts of the right dome of the liver, I find the "boomerang" shaped incision here given. It consists of an oblique part, comparable with Kocher's oblique incision, but shorter and nearer to the costal margin, and an upright part, four to five inches in length, beginning over the fourth right chondro-sternal articulation and extending caudally to one inch below the costal margin to meet the medial end of the first part of the incision.



The oblique part of the incision is first made and taken through all structures of the abdominal wall.

Complete exploration of the peritoneal cavity follows. The number and position of all cysts present are ascertained. Upon their site will depend whether the upright part of the incision is needed or not. Where ordinary retraction will not give the necessary freedom of approach to the cysts on the right dome, the upright part of the incision is then made and taken down to the cartilages.

All structures external to the fifth and ninth cartilages are raised in one flap. The fifth to ninth cartilages are divided obliquely to the surface just medial to the line of the internal mammary artery and again just medial to the costo-chondral junctions, or in some cases the ribs themselves are divided as far out as required. The oblique division prevents inward suction of the cartilage by respiration after the operation. Care must be taken not to buttonhole the pleura.

[1] The summary of a paper read at a meeting of the Royal Australasian College of Surgeons at Ballarat, Victoria. Accepted for publication on October 23, 1944.

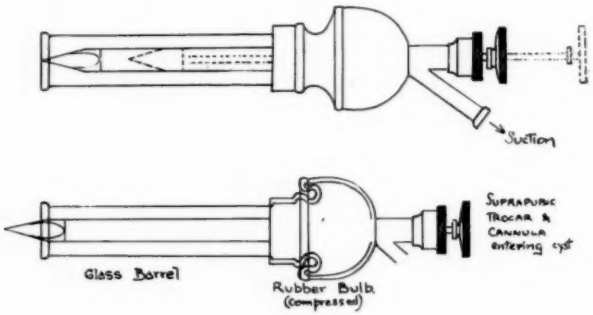
It is now possible to retract the whole area sufficiently in cranial and lateral directions somewhat like a Venetian blind to uncover the right dome as far as desired. When no short adhesions to the diaphragm exist the dome of the liver can be rotated forward to some extent also.

Over the transpleural route this approach has advantages on every one of the following points. (i) There is room to extend the incision; the frontal attack can be extended to either flank. (ii) Exploration can be complete; in over 50% of cases more than one cyst is present. (iii) In most cases the diaphragm need not be injured. (iv) In most cases the pleura need not be touched. Barnett showed in 1938 that almost twice as many patients die after transthoracic technique as after use of the abdominal method.

Costantini's route and Ivanissevich's route may for special drainage purposes be regarded as variations of the above type of approach.

The Suction Trocar Cannula.[1]

The intracystic pressure of unruptured hydatid cysts is generally high. On the first puncture of such cysts with a trocar, fluid is at once forced past and spills around. No operator can feel happy about the distant future of such soiling, whatever the fullness of his immediate operative success.



For this reason I have been using for some years a combination of a trocar and cannula inserted through a suction bell. With this apparatus it is possible to catch the spilled fluid, to draw it off and to sterilize to one's entire satisfaction the delimited and controlled area of soiling. At first I used a bore of three-sixteenths of an inch, but now use a bore of one centimetre. A very satisfactory instrument can be made by punching a hole of 0·8 millimetre in the rubber bulb of a battery hydrometer, removing the rubber tip, and inserting a suprapubic trocar and cannula through the bulb (see diagram).

[1] The illustration shows the trocar and cannula one-third of its actual size.

Case Reports.

STRICTURE OF THE COLON.[1]

By G. H. BURNELL,
Adelaide.

THIS patient was shown at the November, 1944, meeting of the South Australian Fellows of the Royal Australasian College of Surgeons for two reasons: (*a*) because the condition, in my experience, is rare; (*b*) in order to illustrate the value of Devine's disconnecting colostomy in rendering safe those operations on the large bowel which would otherwise carry a considerable risk.

Miss A.W., aged thirty-one years, a trained nurse, was admitted to the medical wards of the Royal Adelaide Hospital on December 4, 1942. She gave a history of very frequent bowel actions for three months past, the motions consisting of blood and mucus; she had considerable pain both before and after the motions, and had noted that her temperature rose to about 100° F. each night. Nothing of importance was discovered by a general clinical examination, and a diagnosis of ulcerative colitis was made. The patient was treated by injections of lactoflavine, and later with liver extract. On March 22, 1943, I was asked to perform sigmoidoscopy. The instrument could be passed only for nine inches. The bowel showed general congestion of the mucosa, with flakes of adherent lymph, but no ulceration was seen. In view of my inability to pass the instrument more than nine inches, I recommended that a barium enema should be given. The report on this, March 25, 1943, read: "There is a constricted segment proximal to the splenic flexure, and haustration elsewhere is absent: the appearances are consistent with chronic colitis, with development of a stricture."

On April 5, 1943, laparotomy was done, but nothing abnormal could be felt in the large bowel, and the wound was closed. The patient was discharged on May 21, 1943, with instructions to report back to the ward periodically.

On November 6, 1943, she was readmitted with the following history. She had remained reasonably comfortable since discharge, although she continued to have frequent bowel actions, until September 20, when she began to feel nauseated and lost her appetite, which up till then had been good. She now complained of attacks of sudden pain under the left costal margin. She was losing weight steadily. She was found to be running a remittent temperature, rising to about 101° F. each night. Examination revealed in the left lumbar region a large hard tender mass which did not move with respiration.

On November 9, 1943, another barium enema was given. The report on this read: "The patient was unable to retain the enema satisfactorily; the portions of large bowel which do contain barium are very smooth walled, and the appearances are consistent with chronic colitis."

On November 18, 1943, a retrograde left pyelogram was prepared. The radiologist reported on this as follows: "It is difficult to say whether the tumour is of the kidney or external to it."

On November 22, 1943, another laparotomy was done. A transverse incision on the left side was made, at about the level of the umbilicus. The mass was found to consist of a hard fibrous tumour, surrounding the descending colon, and containing several pockets of pus. These latter were drained and a piece of the fibrous tissue was removed for histological examination. Dr. Thiersch reported on this: "The tissue consists of chronic inflammatory granulations, surrounded by a mass of fibrous tissue." On January 5, 1944, copious fæcal discharge from the wound commenced, and this discharge continued until January 24, 1944, when a Devine's disconnecting colostomy was done; the fæcal discharge from the laparotomy wound ceased forty-eight hours after the colostomy was done. Shortly after this daily wash-outs of the lower bowel were commenced, the wash-outs being given alternately from the colostomy end and from the anus.

By February 9, 1944, the wash-outs would no longer pass from the anus to the colostomy opening, so that the fluid had to be introduced from both ends in order to cleanse the bowel thoroughly.

[1] Accepted for publication on November 27, 1944.

On February 18, 1944, the patient was transferred to the convalescent wards at Magill, my intention being to allow the colostomy to function for six months so that the inflammatory process surrounding the left colon might resolve as completely as possible.

On August 24, 1944, she was readmitted to the Royal Adelaide Hospital. The next day a muscle-splitting incision was made in the left lumbar region. It was then found that the previous inflammatory mass had completely resolved, but that the descending colon, over a length of five inches, was stony hard, and shrunken. This five inch length of the descending colon was excised, and an end-to-end anastomosis of the bowel was done; in order to obtain sufficient mobility, it was necessary to mobilize the splenic flexure. Dr. Thiersch reported on the portion of bowel removed: "It is an inflammatory stricture of the colon, with no evidence of amœbic infection or carcinoma."

On September 19, 1944, a barium enema was given and the report on this read: "The gut is narrowed at the point of anastomosis, but there is passage of barium through the anastomosis."

On September 27, 1944, Devine's enterotome was applied, and the spur of the disconnecting colostomy was crushed. The enterotome was removed on September 30.

On October 5, 1944, the bowels acted naturally *per rectum*, and the patient has continued to have one, or at most two, natural bowel actions per day ever since, there being only a little mucous discharge from the colostomy openings.

On November 7, 1944, a final barium enema was given, and this revealed free passage of the barium from the anus to the caecum, with almost no evidence of stricture at the site of the anastomosis.

On November 9, 1944, the colostomy openings were easily closed under local anæsthesia. This could have been safely done much earlier, but the colostomy had been allowed to remain so that the patient might illustrate what little inconvenience is caused by the presence of a disconnecting colostomy.

Apart from this case, I have found the disconnecting colostomy particularly valuable in rendering fit for operation patients who are in poor general condition but who have to undergo such a major procedure as a perineo-abdominal excision of the rectum. A minimum period of three weeks must be allowed between the colostomy and the excision, but the improvement in the general condition of the patients during that period is very striking. I have not experienced any trouble from the presence of a colostomy opening in obtaining primary union of the incision made for the second operation.

MYOMA OF STOMACH.[1]

By LEONARD BALL,
Melbourne.

IT has been stated that innocent tumours of the stomach found at autopsy form over 20% of all gastric tumours. In fact, collected figures showed remarkable similarity. Dudley, Miscal and Morse,[1] in 4,000 post-mortem examinations of stomach tumours, found 22% to be benign. Stewart[2] in 11,000 found 22·8% innocent, and Ryler and Erickson[3] in 6,000 post-mortem examinations found tumours to be innocent in 26·2% of the cases. These figures approximate to the findings at the Alfred Hospital, Melbourne, but it must be borne in mind that most of these tumours are small, symptomless and undiagnosed and never need treatment.

During the past ten years only four innocent tumours of the stomach, all myomata, have been diagnosed and surgically removed at the Alfred Hospital; of these, two were submucous and were removed by gastrotomy, one was intramural and was removed by gastrectomy, and the other, which was subserous, was removed by local excision.

The first patient, whose history is here reported, was Mrs. D.F., aged thirty-seven years. She was admitted to the medical wards of the hospital in April, 1938, complaining of indigestion which had been present for eighteen months, with a good deal of flatulence and a feeling of fullness after meals. She stated that she had lost about ten pounds in weight. For the previous six weeks she had had severe attacks of colicky pain in the epigastrium associated with vomiting, and her appetite had been poor.

A cholecystogram showed a normally functioning gall-bladder. A test meal revealed a lowered total acid content and a low free hydrochloric acid level. After a month's treatment she was discharged from hospital. In November, 1938, she again attended hospital, and at this time her symptoms had persisted, the attacks of severe pain had become more frequent and she had on four occasions vomited blood. The hæmatemeses were never severe, the quantity of blood being usually two to three ounces. Her appetite had become worse and she had lost two stone in weight.

A barium meal was reported as revealing infiltration along the lesser curvature near the *incisura angularis*. The appearances suggested carcinoma.

Gastroscopy was done by Dr. J. E. Sewell, who reported the presence of a large tumour at least two inches in diameter on the lesser curvature just above the angularis. The growth was well demarcated above, and perfectly smooth, rich in colour and with no ulceration; it was freely mobile with respiration. Just at the angularis there was some irregular nodularity, the mucosa on these nodules being very pale. There was no peristalsis in this area, but it was active on the greater curvature of the antrum. The rest of the gastric mucosa was pale, and there was no evidence of gastritis.

Dr. Sewell reported that the growth was quite typical of a benign tumour except for the irregularity in the region of the angularis. He thought it was a non-ulcerating operable carcinoma, but added that he would not be at all surprised to find that the tumour was benign.

FIGURE I. Myoma of stomach removed by gastrotomy. Weight 150 grammes.

The patient was admitted to hospital for operation in December, 1938. High spinal anæsthesia was induced with one in 1,500 "Percaine". A left upper paramedian incision

[1] Accepted for publication on September 26, 1944.

was made, the stomach was exposed and a large mobile mass was felt through the anterior wall of the stomach. There was no peritoneal involvement and no glands were palpable. The stomach was opened and a tumour the size of a small orange, and apparently innocent, was found attached to the posterior wall just below the lesser curvature. The tumour was easily shelled off the muscle (see Figure I) and the mucosa of the stomach was reconstituted. The incision in the anterior wall of the stomach was repaired, and the abdomen was closed without drainage.

The patient's post-operative course was entirely without incident, and she was discharged from hospital three weeks after the operation.

The pathological report stated that the tumour was a benign fibro-myoma weighing 150 grammes (see Figure II).

In June, 1941, a barium meal examination revealed a normal stomach, and in June, 1944, the stomach still appeared to be normal.

FIGURE II. Photomicrograph of myoma. × 350.

At present this woman is entirely free from gastric symptoms, she has put on over three stone in weight, and is fit enough to do the housework for herself and her seven children.

It would appear that the symptoms of gastric myomata are rather vague, the patient usually complaining of flatulence and fullness after meals.

Hæmatemesis seems to be almost constant with submucous myomata. In one case reported by Eckhoff[4] the patient had a hæmoglobin value of 38%. Upper abdominal colic, which makes the differentiation from cholelithiasis a little difficult, is apparently caused by a tumour being caught in the pylorus. A palpable tumour may be the first sign, and Muir[5] reports a case in which a submucous tumour was removed by gastrotomy; the patient first complained of abdominal colic and had a palpable tumour. The rate of growth is slow, and Willis[6] has reported the post-mortem findings on a patient who had been under observation for six years with a palpable subserous myoma slowly growing all that time. This type may attain great size, and Toland and Kroger[7] have removed surgically a subserous myoma of the stomach weighing 700 grammes.

These tumours appear to be more common in females than in males, and all of the tumours mentioned were in women.

Dr. Sewell and I had intended reporting this case in 1940, after sufficient time had elapsed to assess a cure, but our departure on service prevented this.

Acknowledgement.

I should like to thank Dr. R. A. Willis for his help in preparing specimens and giving advice.

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Surgery in Other Countries.

[In this column will be published short résumés of articles likely to be of practical value from Journals published in other countries and not readily accessible to surgeons in Australia and New Zealand.]

THE DEFUNCTIONED ASCENDING COLON FOLLOWING PARTIAL TRANSVERSE COLECTOMY.

F. L. Duschl (Willingen): *"Erfahrungen nach operativer Ausschaltung grösserer Dickdarmabschnitte", Archiv für klinische Chirurgie,* Volume cciv, March, 1943.

THE treatment of acquired megacolon must be directed at its cause. Stenoses of mechanical origin can be successfully treated by operative measures only after accurate diagnosis. The large bowel differs essentially from the small in that, in addition to the structural differences in the bowel walls, internal forces have a large effect in the colon. Gas pressure and the weight and onward drive of the fæcal mass both exert a passive effect in addition to the active forces common to all muscular tubular organs. These factors must not be forgotten in planning operative attacks on the large bowel. Otherwise dangerous stasis and reverse filling of the excluded segment may lead to wide dilatation and the so-called secondary megacolon.

An illustrative case is reported. A middle-aged man had a malignant tumour removed eleven years previously from the mid-portion of the transverse colon. The two cut ends were closed and a loop of ileum was anastomosed to the distal segment by a side-to-side anastomosis, which, however, was placed anisoperistaltically. Later, at a second operation, another anastomosis between the lower part of the ileum and the ascending colon was made, with the hope of draining the large right segment of colon. However, this segment continued to develop a huge degree of megacolon, which was finally cured only by resection of the entire right segment together with some of the ileum; the operation was completed by making a new end-to-side anastomosis between the ileum and the distal part of the transverse colon in place of the original side-to-side anastomosis.

The original operation, resection of a highly malignant tumour, was thoroughly carried out, and after twelve years the patient showed no signs of metastases. But the management of the colon requires criticism. And end-to-end union of the two cut ends of the divided colon is often technically impossible, particularly when one remembers the difficulties which must arise if the tumour is in the neighbourhood of the middle colic artery, ligation of which will impair the nutrition of the whole colon. Apart from that, if a large section of the bowel has to be removed, such an anastomosis may be possible only under tension, which is undesirable.

The procedure adopted in the case quoted, closure of the two ends and a side-to-side ileo-colostomy, has the disadvantage that a very large portion of the colon must be left *in situ*, but excluded from its normal function. The enormous cul-de-sac thus created is exceptionally difficult to empty. Its glands keep on secreting, fermentation gases form, and all must be emptied against the normal route of flow. Experienced surgeons endeavour to avoid leaving any such large functionless segment. In this case also the ileo-transverse-colostomy applied was technically faulty in that it was made in an anisoperistaltic fashion. As a result the contents of the ileum passed on to the caecum as they normally would pass, until the pressure in the right side of the colon reached a height which caused them to pass through the anastomosis into the distal segment of the colon. A year of these circumstances brought about a great dilatation of the proximal colon with symptoms of a chronic but compensated colonic obstruction. The attempt to relieve this by a second anastomosis between the lowest part of the ileum and the ascending colon was intrinsically badly planned, and its only result was that the last loops of the ileum shared in the dilatation of the right colon.

The decision to operate again on this man was easy to make on account of his very serious condition. Chronic ileus must be relieved. No shortcircuiting operation seemed to promise any success, and the decision to perform a radical removal of the whole affected segment was taken. In such a resection it is important to leave behind as much parietal peritoneum as possible, to allow for the covering of the bared surface of the posterior abdominal wall. Failure to do this efficiently leads to seepage of tissue fluids, infection, adhesions and troublesome constipation. The final operation in this patient was technically straightforward, except for the adhesions met with on opening the abdomen, and his post-operative course was smooth.

It was interesting to observe in the subsequent X-ray films how the bowel had moved to occupy the position from which the huge mass had been removed. The sigmoid lay well over to the right side, and the lower part of the ileum lay immediately below the right lobe of the liver. In spite of this, its motor and secretory functions were unaffected. The stools were normal from the first, following the operation, and this would not be unexpected seeing that the ascending colon had not been functioning for the twelve years prior to it; and it is well known in any case that in total colectomy the distal loops of the ileum can take over the functions and even some of the anatomical appearances of the colon.

ARTHUR E. BROWN.

THE USE OF HETEROGENOUS SERUM AS A BLOOD SUBSTITUTE.

Schwiegk, de Niederhäusern and Meinzinger: "*Über die Verwendbarkeit von artfremden Serum als Blutersatsmittel*", *Klinische Wochenschrift*, Volume xxii, May, 1943.

MANY researches have firmly established the value of the administration of human serum as a method of blood replacement in emergency. It would undoubtedly simplify matters if animal serum could be used for this purpose; but there lies against this hope the ever-present fear of anaphylactic phenomena following the infusion of such quantities as would be needed.

Lengenhagger has proposed a method of removing the antigenic properties from heterogenous serum, so that parenteral injection will not cause anaphylaxis. Ox plasma, after the addition of 7·7% glucose, was frozen and dried *in vacuo*. The dried serum dissolved in water was heated for ten minutes. In the heating coagulation of the serum albumin did not occur. An injection of this heated serum into animals produced no anaphylactic symptoms.

Frimberger, however, repeating this experiment, disproved its main claims. His injections of the heated serum into animals which had received the usual preliminary treatment, regularly produced a fatal anaphylactic shock. After preliminary treatment with the heated serum the animals were apparently not sensitive to ordinary serum; but to the heated serum they were highly sensitive.

Cassinis, de Niederhäusern and Gennari felt that the object might be attained by a slight variation of the technique. They added 10% glucose, diluted down the redissolved serum with 2·5 to 1 distilled water, and then heated this for forty minutes. For further proof as to whether such alterations could affect the antigenic properties of serum in the manner described, the present authors prepared human serum by the addition of glucose, drying, redissolving and diluting it. This solution was heated for periods of five, ten, twenty and forty minutes, at temperatures of 50°, 60°, 80° and 100° C. All these solutions produced typical anaphylactic shock when injected into guinea-pigs. It is evident therefore that the hopes that such treatment will remove the antigenic qualities from heterogenous serum are not substantiated.

On the other hand, the main value of serum as against saline solutions as a blood substitute lies in the osmotic pressure exerted by its colloids, and this prevents the premature diffusion of the fluid out into the tissues. The authors therefore sought to find out whether this osmotic power was affected by the heating treatment. They showed that after the serum was heated at 60° C. the osmotic pressure was reduced from 195 to 183 millimetres of water. Heating at 70° C. reduced it to 87 millimetres. At 80° C. it fell to 29 millimetres and at 100° C. to 21 millimetres of water. These values remained the same with the heating continued up to forty minutes. It is also evident from the fact that the serum albumin no longer coagulates on boiling, that some denaturization of it has occurred. Therefore, it seems clear that by such treatment not only is the serum not freed from its antigenic properties but it also loses one of its most valuable qualities.

ARTHUR E. BROWN.

A METHOD OF HIGH SPEED CHEMICAL STERILIZATION OF CATGUT.

Professor N. I. Krause (Director, Surgical Clinics, Sanatov Medical School): *Khirurgiya*, 1943, Number 7.

THE present-day methods of chemical sterilization of catgut are based on impregnation with antiseptics. When iodine solutions are employed for this purpose the iodine is absorbed on the surface of the catgut and hardens it. The rate of impregnation of the deeper layers of the catgut is considerably slowed down by the formation of this "cortical" iodized layer causing the "iodization" to be slow and uneven. The author's method has for its object the spreading of the iodine evenly through the whole thread. His method is based on the principle of impregnating the catgut with iodide and then precipitating the iodine within the catgut thread. A solution of potassium iodide is used to impregnate strands of catgut. Iodine is precipitated from the potassium

iodide by the action of chlorine gas (and chlorine dioxide), a small amount of hydrochloric acid in water, and exposure to light. The concentration of iodine within the thread can be fully controlled by suitably adjusting the strength of this "basal" solution.

First Stage.—Damp gut is impregnated in a solution of potassium iodide. It is then placed into the vapour of chlorine or chlordioxide. The gut darkens immediately and in a few minutes iodine is uniformly precipitated through the whole thickness of the thread.

Second Stage (Decolorization).—When the catgut remains for a further period in this gaseous mixture, it starts to decolorize. It soon becomes reddish-orange and then (if sufficiently damp) it becomes decolorized. It is during this phase that highly active bactericidal substances are produced.

Third Stage.—The decolorized thread is immersed in a solution of potassium iodide and becomes strongly iodized. The amount of iodine formed in the thread this time is higher than that produced during the "primary iodization" in gaseous chlorine. As far as bactericidal action is concerned, this third stage is the most effective. In all stages a sterilization is produced by chemicals in their most active chemical state—that is, when *in statu nascendi*. A 3% potassium iodide solution is the most suitable "basal solution" for preliminary impregnation of catgut. For all tests the author has used catgut massively infected with resistant spore forms of *Bacillus subtilis*. Bacteriological tests revealed a few cases of growth after the first stage. Catgut was invariably sterile after the second stage. But, for different reasons, it was found necessary to pass the catgut through the third stage to iodize it after it had been decolorized. As potassium iodide solutions are not sterile, it is advisable to use solutions containing a small amount of iodine—0·125% to 0·25%. Some decrease in the strength of the catgut is caused if the catgut is iodized too long in the third stage (up to a black colour). If the catgut has been too strongly iodized in the third stage it should be transferred into an alcoholic 0·5% solution of iodine. It has to be realized that catgut supplied by the manufacturers loses 50% of its strength (especially in knots) when moistened. The same applies to catgut sterilized by any iodine method. For this reason catgut is best used dry or stored in alcoholic iodine solutions and dried before use.

Preparation of the Catgut.—A quantity of 3% "basal" solution of potassium iodide is prepared, sufficient to cover the whole batch of catgut. Lugol's solution—iodine, potassium iodide 3·0 grammes, *Aqua Distillata* 100 cubic centimetres—is prepared and the following amounts are added to the "primary" solution. For each 2·5 metres of thread: for number 0, 2 drops; for number 1, 3 drops; for number 2, 4 drops; for number 3, 5 drops; for number 4, 6 drops; for number 5, 7 drops; for number 6, 8 drops. The "basal" solution is iodized in order to prevent development of moulds and bacteria during storage. To bring about a preliminary "engorgement" of the catgut the hanks are immersed in this iodized solution for one to two hours (depending on thickness of the strands). During the "engorgement", the threads get twisted around themselves. They are then taken from the solution, the ties fixing the hank are cut, and the thread is seized by its middle and allowed to untwist. Numbers 4, 5 and 6 of 2·5 metre length are divided into two. The untwisted strand is wound around three or four fingers. The hank is fixed by winding the free end loosely three or four times around it. In order to prevent the hanks from drying, they are placed between damp four-layer gauze packs. They are then immersed into the same solution for twenty-four hours. The catgut absorbs the iodine, being a yellowish colour, and decolorizes the basal solution. In this solution the catgut can be stored; it does not deteriorate and is always ready for sterilization.

Apparatus.—A wide mouth jar with a ground glass stopper is required. The wider the mouth, the more hanks can be sterilized simultaneously. A cork or properly fitting wooden stopper, which is impregnated with paraffin, is fitted to the jar. A hook made of glass rod or tubing is inserted into the centre of the stopper. The width of the hook should be one centimetre less than that of the mouth of the jar. The hook should be so adjusted that the lower part of the hanks is six centimetres from the bottom of the jar.

Preparation of Gaseous Chlorine and Chlordioxide.—Potassium chlorate is the most suitable salt. It produces chlordioxide simultaneously with chlorine. Chlordioxide is a gas of an intensive yellow colour. This colour serves as an indicator for the concentration of the gases. During sterilization the bright yellow gas should fill the jar to the top. The most convenient chemical for the preparation of these gases is "chloracid". Twenty grammes of chloracid are placed on one side of the bottom of the jar, which should be quite dry and then moistened with four cubic centimetres of hot water. In order to hasten the production of gas, the bottom of the jar is heated by immersion in water at 65° to 70° C. until the chloracid becomes yellow and starts to form gas bubbles. The production of chlorine from chloracid is slow and steady. The formation of gas is maintained by warming the jar every time the bubbling stops. Several dozen hanks can be sterilized with 20 grammes of chloracid. Chlorine can also be produced by other methods. One gramme of potassium chlorate is mixed with

1·0 gramme of common salt, placed on a side of the jar and moistened with 0·5 cubic centimetre of water. Then drop by drop (a dropper is used) approximately 1·0 cubic centimetre of concentrated sulphuric acid is added. When the formation of gas is stopped the bottom of the jar is warmed or a few drops of sulphuric acid are added. Gas can also be produced by action of hydrochloric acid on potassium chlorate when to 1·0 gramme of this salt concentrated acid is added drop by drop. It can also be produced from potassium permanganate and hydrochloric acid.

Sterilization.—When the jar is filled with gas the sterilization may be started. Hanks are so chosen that they can be placed loosely on the hook. The thickest catgut is placed first and the thinnest last. Thin catgut is decolorized earlier and can be taken off whilst the thicker is left for further chlorination. When the hanks are removed from the "basal" solution, they are placed between gauze packs and pressed so as to remove surplus moisture. Whilst damp the hanks are hung on the hook and lowered into the chlorine. They are kept in the gas until they acquire first a black and then a uniformly reddish-orange tint. The speed of the decolorization depends upon the concentration of chlorine and chlordioxide and upon the number of hanks. By warming the bottom of the jar the proper level of chlorine can always be maintained. During chlorination it is advisable to shake the hanks, achieving thereby a more uniform decolorization. It takes four to seven minutes to decolorize numbers 0, 1, 2 and 3; seven to ten minutes for number 4; ten to fifteen minutes for numbers 5 and 6. After the hanks have changed to a reddish-orange, they are transferred to a solution containing potassium iodide 3·0 grammes and iodine 0·015 gramme in 100 cubic centimetres of water. When the catgut has been in this solution for ten minutes it is ready for use. It is not advisable to iodize the catgut to a colour deeper than dark brown. The catgut is stored in alcohol containing 0·5% iodine and 1% potassium iodide. The potassium iodide neutralizes the hydroiodic acid formed in alcoholic solutions, and thus prevents damage to the catgut. The catgut can also be stored in a dry state. It can be wound onto sterile microscope slides, dried between sterile gauze packs and stored in a jar with a ground glass stopper. This method reduces the necessity for the use of ampoule catgut in areas of military operation and supplies the surgeon with strong, elastic and absolutely sterile catgut.[1]

H. B. DEVINE.

Reviews.

Orthopædic Surgery. By WALTER MERCER, F.R.C.S., F.R.S. (Edin.); Third Edition; 1943. London: Edward Arnold and Company. 9″ × 5½″, pp. 958, with illustrations. Price: 45s.

THE general arrangement of Walter Mercer's book is excellent, and the various chapters are clearly defined and to a great extent complete in themselves. The illustrations, on the whole, are adequate, though details in some of the reproductions of skiagrams are not as clear as might be expected. There is a very complete bibliography with the index and throughout the text the author has fully acknowledged the sources of his information. He has in fact achieved his stated purpose—that of covering the subject in an adequate manner. We think, however, that the book is getting out of hand and that there is material in it that is redundant. For instance, it is unnecessary to describe seven operations for recurrent dislocation of the patella, the majority of which have long since been rejected by practising orthopædists, the more especially as one does not find numbered amongst the seven the very simple procedure of excision of the patella, which, in our hands, has so far proved entirely satisfactory for the prevention of this distressing accident.

Affections of the feet and back probably form the bulk of orthopædic practice, so that we turn to these chapters with interest. Disabilities of the feet and their management are most excellently dealt with, and, except that no mention is made of the acute metatarsalgia recently described by Betts which can be completely relieved by excision of a digital nerve neuroma, no serious criticism can be made. The chapter on backache, as indeed in most orthopædic textbooks, is disappointing. After careful study, one is still left undecided when to inject, when to manipulate, when to immobilize and when to operate in response to the patient's complaint of pain. We certainly do not recommend to orthopædists the abdominal approach for fixation of the lumbo-sacral joint when a perfectly satisfactory and much safer posterior route is always available.

The chapters on such standard subjects as congenital and acquired deformities, bone and joint tuberculoses and poliomyelitis are sufficiently orthodox to satisfy the

[1] The literal translation from the Russian by Captain S. S. Marshall is available on request. The above abstract has been made from Captain Marshall's translation.

purist. However, we do not approve of manipulating elbows other than in the most exceptional circumstances, and think that the author has been a little casual in his warnings against the dire results of ill-advised attempts to speed up the rehabilitation of this joint. "Limb equalization" is mentioned, but little real help will be derived by the surgeon about to embark on this most difficult and somewhat hazardous procedure, from what has been written here.

In spite of these criticisms we know that since the first edition appeared, many Australian orthopædists have never been without it, and have constantly referred to it, rarely without satisfaction. We can confidently recommend this book to all surgeons who may be called upon to treat orthopædic conditions. The author is indeed to be congratulated on producing, especially under difficult wartime conditions, the third edition of what has always been a real contribution to the study of orthopædic surgery.

Surgery of Modern Warfare. Edited by Hamilton Bailey, F.R.C.S.; Third Edition (in six parts); 1944. Edinburgh: E. and S. Livingstone. 8½" × 5¾". Part I, pp. xvi and 151, with 165 figures; Part II, pp. 153 to 328, with 146 figures; Part III, pp. 329 to 506, with 312 figures; Part IV, pp. 507 to 716, with 243 figures; Part V, pp. 717 to 896, with 114 figures; Part VI, pp. 897 to 1108, with 146 figures. Price: 15s. each part.

THE third edition of "Surgery of Modern Warfare" has now appeared in six small volumes instead of two as in the second edition.

Considerable revision has been done and new illustrations have been added. The chapter on the localization of foreign bodies by X rays is written by J. F. Brailsford, instead of by Hodgson and Ramage as in the previous editions.

As stated in our review of the second edition there are some excellent chapters, but, as is probably inevitable in a book which is the work of many authors, there still remains an unevenness. Nevertheless the book will be of help to the young medical officer who may be called upon to deal with wounds under conditions of active service. He must distinguish between the urgent treatment in the field and the more elaborate methods practicable in a hospital. In this regard the principles of treatment of wounds of the limbs, including long bones and nerves, of the chest and of the abdomen are adequately described, and many useful minor procedures are illustrated.

When we consider the difficulties under which England still labours, the production of a third edition of this book within three years is a matter for congratulation of the authors, the editor and the publishers.

The Essentials of Modern Surgery. Edited by R. M. HANDFIELD-JONES, M.C., M.S., F.R.C.S., and A. E. PORRITT, M.A., M.Ch., F.R.C.S.; 1943. Edinburgh: E. and S. Livingstone. 9½" × 6", pp. 1220, with 624 illustrations. Price: 40s. net.

A NEW EDITION of this well-known book follows much the same lines as its predecessor of 1938. Paper shortage and war conditions have made its production in wartime difficult, and no doubt another edition will appear when the war ends. But nevertheless it contains much worthwhile material. It has many new illustrations (for which there is no index) and among them are paintings in oil colour by Anna Zinkeisen, some of which are extremely good; a frontispiece showing an operation in progress is particularly attractive.

The chapter on wounds and burns has been altered; but space has not permitted more than a mention of recent advances in the pathology, and in the treatment of burns no mention is made of the use of pressure dressings, sulphonamide drugs, or the value of early skin grafting in the prevention of fibrosis and deformity.

The chapters on shock and wounds and burns have been added to in this edition. A section on low back pain has been added also, no mention being made of prolapsed *nucleus pulposus*, nor is this included under the heading of sciatica.

Minor Surgery. By R. J. MCNEILL LOVE, M.S., F.R.C.S., F.I.C.S.; Second Edition; 1944. London: H. K. Lewis and Company, Limited. 7" × 4¼", pp. 310, with 201 illustrations. Price: 15s. net.

WHEN the student commences his duties as a dresser in the casualty department or surgical wards, he requires a concise guide book to minor surgical procedures and their after-care. This convenient little volume, by an author whose fame as a surgical tutor and coach was widespread, is specially intended for the student studying clinical surgery, but should also prove very useful to the general practitioner performing everyday minor surgical procedures.

Although compact, it is well illustrated, particularly in the section on fractures and dislocations, and the useful practical hints, wisely rather dogmatically expressed, are very sound. It is a book which every fourth year student should read.